

Final Report - Findings and Recommendations  
Associated with the Development of the  
Hazardous Materials Shipper's Guide

Task VII - Final Report  
NASW 3789

(NASA-CR-186490) FINDINGS AND  
RECOMMENDATIONS ASSOCIATED WITH THE  
DEVELOPMENT OF THE HAZARDOUS MATERIALS  
SHIPPER'S GUIDE (Ecosystems International)  
114 p

N90-71402

00/81 Unclas  
0272286

**A Final Report on the Findings and Recommendations  
Associated with the Development of the  
Hazardous Materials Shipper's Guide**

**Submitted to:**

**The Office of Research and Development  
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Department of Transportation  
Washington, DC 20590**

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**April 30, 1985**

**Under NASA Headquarters  
Contract Number NASW 3789  
Task VII**

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## Section I: Introduction

This report has been prepared to "develop details of extended application of Task VI commodities to the full range of hazardous materials necessary to cover 95 percent of expected annual rail movements. Prepare and document plan to accomplish through cooperative industry/FRA project." \*\* To accomplish this, the report consists of seven major sections, all of which build toward the end objective of meeting the requirements of Task VII.

Section I consists of this Introduction to the report while Section II provides an overview of the results of Tasks V and VI. Section III provides a synopsis of the Hazardous Material Handling Guide (HMHG) Evaluations that were completed for Task VI as well as discussing the trends evidenced by those evaluations. Section IV compares the commodity information desired in the original shipper's guide concept with that of the preliminary HMHG. Comments are also provided concerning the impact of scope definition on the end product.

Section V discusses the proposed format that a Hazardous Materials Shipper's Guide (HMSG) could take to achieve the desired results and provides some examples of how the information might be presented. Section VI presents a proposed plan for how the guide could be produced to the satisfaction of the Federal offices/agencies and industry and the contractor's recommendations for implementation of the proposed plan. Section VII consists of a series of Appendices providing amplifying information in detail.

\*\* Task VII, Statement of Work, NASA Contract NASW-3789

## Section II: Background Information

The objective of Task V was to "develop and describe appropriate tools, processes, and mechanisms which can be employed to more efficiently manage and ensure safety improvements beginning with each region and incorporate into a national perspective. Develop a user oriented approach to presenting shipper information and perform test to determine viability. As a minimum use one commodity from Task VI in a sample format to assess user acceptability in sufficient detail to facilitate meaningful critiques." \*\* To meet these objectives, the concept of "shipper's guides" for specific hazardous materials was initially decided upon. After several iterations using selected commodities, it was determined that a shipper's guide format would not be the optimal form to employ. It was decided that a book, styled and sized much like the 1984 Emergency Response Guidebook published by the Materials Transportation Bureau (MTB) of the Department of Transportation (DOT), would be the best alternative.

A sample "guide" was prepared to better envision the concept. A total of 113 hazardous material commodities were addressed in the "rough cut" to determine what information could, should, would be contained in the guide as well as the selected format in addressing all classes of hazardous materials. This guide was evaluated by the Federal Railroad Administration (FRA) Office of Research and Development (R&D). This evaluation, and subsequent potential user informal evaluations, resulted in directed guidance to alter the format, content, and scope of the pilot guide to be prepared in Task VI.

The goal of Task VI was to "conduct a pilot project to test

\*\* Task V, Statement of Work, NASA Contract NASW-3789

application of the proposed tools developed in Task V on ten (as a minimum) defined hazardous material commodities. Prepare a comprehensive sample and test the application of the selected commodities. Develop a concise user oriented format and complete a booklet for the ten (et al) hazardous commodities selected. Test effectiveness of approach. Prepare a manual to describe process and usage. Make recommendations for full implementation." \*\* With this in mind, guidance was provided which directed that a preliminary (P) HMHG be prepared that would provide information from the Code of Federal Regulations (CFR) on the safe transport of hazardous materials by rail for:

1. all hazardous materials in general
2. all flammable gases
3. two non-flammable gases
4. all combustibile liquids
5. one commodity from each of the remaining thirteen hazardous material classes
6. and such supporting information as deemed necessary to provide broad clarification and application of the above.

The information contained in the HMHG(P) was to be extensive enough to provide evaluators with the scope and content of the envisioned guide as well as employment of the Enyart Technical Language Control (ETLC) System. ETLC is a man-computer interface procedure whereby technical data may be written to a pre-specified reading comprehension level. The purpose of its employment here is to enhance the safety of hazardous material transport by rail by simplifying the language and requirements of the CFR. The premise is that if a technical requirement for safe

\*\* Task VI, Statement of Work, NASA Contract NASW-3789

handling is easier to understand and retain, then safety will be improved by its greater use and application in the industry.

Upon completion of the draft text, copies of the HMMHG(P) were produced. These copies were then delivered to personnel in the Federal Emergency Management Agency (FEMA) and Bureau of Explosives (BOE) of the Association of American Railroads. An oral/vu-graph presentation was made at each delivery to explain the desire to solicit their comments and evaluation of the HMMHG concept. (Copies were provided to the FRA Office of Safety but without the oral presentation). A summary of the evaluation effort is contained in Section III of this report.

### Section III: Evaluation and Findings

#### Evaluation

As stated earlier, the evaluation of the HMMHG(P) was conducted by personnel from FEMA and BOE with additional comments from the FRA Office of Safety. The personnel at FEMA and BOE were provided an oral/vu-graph presentation to familiarize them with the objectives of the evaluation and the HMMHG(P) itself. Each individual was provided with a copy of the HMMHG(P), a mini-HMMHG(P) (as an example of the potential final style, format, size, etc), a HMMHG Concept Evaluation Survey questionnaire (contained in this report as Appendix A), and background information on ETLC. Upon completion of the presentation, the evaluators were requested to complete their evaluation and submit the comments to the FRA Office of R&D. After ample time for a thorough evaluation, the responses were provided to FRA and turned over to the contractor for analysis and comment.

## Findings

The complete text of the consolidated comments is provided as Appendix B of this report. The individual comments are coded within each question number for ease of cross referencing. The comments were further analyzed for trends by comment groupings. Many comments regarded a particular aspect of the guide yet were found throughout the evaluation questions. This trend analysis provided the best information about the concept of the HMHG and warrants further discussion.

The general trends evidenced by the comments fall into the following categories:

1. Emergency Response Information.
2. The function and the need for the HMHG.
3. Definition of the user.
4. Simplification of the CFR.
5. The ETLC System.
6. Scope and/or content of the HMHG.
7. Frequency of revision.
8. Format and presentation of material.

In the HMHG(P), Emergency Response Information had been provided in a condensed form. The source information for this material was the 1984 EMERGENCY RESPONSE GUIDEBOOK (ERG) (DOT P5800.3), A Guidebook for Hazardous Materials Incidents. 100% of the comments of the evaluators indicated a dislike of the inclusion of this information and/or its means of presentation. This mandate indicates that the final HMSG should not attempt to address Emergency Response Information other than to provide the Emergency Response Guide Number and refer the user to the DOT ERG.



The majority of comments concerning the function and need for the HMMHG confirmed that a need does exist for such a guide. But such a need is valid only if the HMMHG returns to the original format of a shipper's guide. Two comments in particular sum up the trend in this category of comments:

"(If) FRA returns to the original scope of work this guide would provide state and local officials a condensed tool to use when inspecting, enforcing, or planning response to hazmat facilities and transport vehicles."

"(A) shippers guide would provide chemical manufacturers and shippers with a consolidated guide to appropriate regulations."

As one nationally known fire chief stated during an informal evaluation of the HMMHG(P), "this guide would provide information a local fire chief needs to know regarding compliance with safety regulations for those jurisdictions that have the authority to inspect rail yards for safety compliance. It would provide a tool to instruct them in what to look for in particular about a hazmat rail shipment."

The original concept of the envisioned user of a HMMHG was generally anyone, individuals and companies, who had to comply with the CFR as it relates to rail hazardous material transport. This was later clarified to include not only manufacturers, shippers, and carriers but also emergency response agencies (fire, rescue, police, etc.) that might find themselves as the "first person" on the scene of a hazmat incident/accident. Comments regarding the definition of the potential user of the guide also confirmed this. Although worded in a variety of ways, comments reiterated the manufacturer, shipper,

carrier, and their employees as being the principal users. Responses also expanded the scope to include warehousing personnel, container manufacturers, and those who specify labels and packagings. Of significant note was the inclusion of Federal, State, and local inspectors and enforcement personnel who are "charged with protecting (the) public through periodic inspection of hazmat facilities and carriers' vehicles". In light of the strong negative response to inclusion of Emergency Response Information, it is not envisioned that emergency response agencies would be a principal user of the guide.

One of the major motivating aspects behind the creation of a HMHG was the concept of simplifying the CFR. This was to be accomplished by application of the ETLC system. Comments in this category of responses favored this concept by a 3 to 1 ratio. Responses of this nature tacitly re-justify the need to produce the HMSG if for no other reason than to simplify the CFR. Anyone who is familiar with the CFR knows that it is difficult to locate particular information about a hazardous material. Pertinent information on the requirements for the safe transport of the commodity in question are spread throughout numerous sections and sub-sections of the CFR . When put to practical use, the reader, even if thorough in their research, has to be left wondering if they might not have missed something. A HMSG which reorganizes this material, in simple form and language, along commodity lines vice subject lines will be of great benefit to the using industries and their personnel.

ETLC was selected as the means of accomplishing this desired simplification of the CFT text. ETLC is the only text editing system today that is guaranteed to translate technical material to a pre-specified reading comprehension level (as measured by the Flesch-Kindcaid formula). Generally comments concerning ETLC favored employment of the system. Comments indicated that the

evaluators favored text that would be written to a reading comprehension level of the 8th to 11th grade range and in such a manner that the user is assumed to have no prior knowledge of hazardous materials. Tests have shown that an application of this type can increase the users retention, an thereby employment of technical information. The guide would not be written as if the user were to read it through once and then know everything and never need to use the guide again. That is not the goal. The goal is to put the safety regulations down in such a manner that when needed, they are easy to locate, understand, and apply.

Comments regarding the scope and content of the HMHG(P) fell into two major sub-categories, commodities to be covered and their means of transport by rail. To put the first sub-category in perspective, the 1984 CFR, Title 49, Section 172.101 (the "101" table) lists over 3000 hazardous materials. The HMHG(P) addressed 113 of those. The evaluators favored covering the complete list of those commodities transported by rail by a 2 to 1 ratio. The precise number of these commodities has not been determined but even that number will vary by the scope selected for the second sub-category, i.e., means of transport. Initially the guide was to address those commodities that were permitted to be transported by rail tank car. The HMHG(P) was prepared in that manner. Yet the evaluators unanimously favored addressing all means of rail transport. This would encompass not only tank cars, but trailers/containers on flat cars (TOFC/COFC), hopper cars, gondolas, and box cars. Depending on the authorized means of packaging, any one of these rail cars could be used to transport hazardous materials. Comments also indicated a desire to address all means of authorized packagings for these commodities. Valid as these comments are, definitive guidance will have to be provided regarding the desired scope of information to be covered. Section V of this report provides some proposals on the manner in which scope can be addressed.

The scope selected will have a major impact on the frequency of revision of the guide. Comments regarding frequency of revision provided no clear indication of what option should be selected. The CFR, basis for information to be contained in the HMSG, is in actuality a dynamic document. Regulations are constantly being changed and added to the code. These changes are made known to the public sector by means of the Federal Register (FR) which is published on a daily and monthly basis. To know all regulations regarding the safe transport of a commodity requires the use of both the CFR and applicable FR's. And, of course, the cost of revision of the HMSG will be linked to the availability of funds provided by budgetary action. Section VI of this report provides considerations regarding the implementation and maintenance of HMSG project.

The frequency of revision will be directly effected by the format and means of presentation selected for the guide. Comments provided suggest that the guide be:

1. A one-volume compendium addressing all selected commodities.
2. A series of volumes where each volume addresses those materials in one of the sixteen hazard classes, i.e., a volume for flammable gases, one for corrosives, etc.
3. A set of "loose leaf" pages that could be ordered by commodity.

Again, no clear cut majority for any one particular form. But each option has its own merits and drawbacks. These will be discussed further in Section VI of this report. In general, the manner of presentation and organization of the HMSG(P) was well received by the evaluators and many of these techniques should be

applied in the development of the final HMSG. Revision of the scope and form will necessitate alteration of many of the techniques employed. The basis of the presentation, the commodity information to be contained in the guide, is discussed in detail in the following Section.

#### Section IV: Commodity Information Comparisons

Appendix C of this report lists those items of information that were originally desired to have provided in the guide for each commodity. This was the original "shipper's guide" concept. In the development of the HMSG(P) during Task VI, several of these were deleted, modified, or expanded. This section of the report will compare the original information requirements of the "shipper's guide" concept and what was actually provided in the HMSG(P). Additional comments are provided regarding the relevance of including an item of information in the proposed HMSG. The comments contained here do not totally reflect the proposed scope of the HMSG. The following numbered items correspond directly with the numbered items in Appendix C.

1. COMMODITY NAME: In all cases, originally, in the HMSG(P), and in the future, "commodity name" refers to the Proper Shipping Name provided for a commodity in 49 CFR 172.101. In Section II of the HMSG(P), the 113 materials covered were listed alphabetically by their Proper Shipping Name, as was the commodity specific information in each Hazard Class Section. The final guide should continue to use Proper Shipping Names.

OTHER NAMES: Other names were also provided in Section II of the HMSG(P) to allow for the possibility of a

user not knowing the Proper Shipping Name. For example, the Proper Shipping Name for ammonia is "Ammonia, anhydrous" but because of the user possibly knowing the commodity by another name or trade name, it was also listed as "AM-FOL", "Ammonia", "Ammonia gas", "Ammonia, liquid", "Ammonia, liquified", "Anhydrous Ammonia", "Liquid Ammonia", and "Liquified Ammonia". Within the Non-flammable Gas Section, the user was then directed from one of these other names to the Proper Shipping Name and thereby to specific information about Ammonia, anhydrous. The 113 Proper Shipping Names provided 676 additional aliases or an average of 5.98 names per commodity. This became rather unwieldy and lengthened the guide considerably. The final HMSG should also list these other names but in a more selective manner.

CHEMICAL SYMBOLS: Chemical symbols or formulas were also provided in the Hazard Class General Information Section for each commodity with the specific information on that commodity. Future provision of this information seems dubious. There is no requirement for the use of chemical formulas in the CFR. It seems to be one of those "nice to know" pieces of information that serves no purpose.

2. CLASSIFICATION (HAZARD CLASS): The Hazard Class of a commodity was provided in Section II of the HMHG(P). It was this basic item of information that the user employed to determine commodity specific information in each Class Section of the guide. Regardless of the scope decided upon, this piece of information must be included in the final HMSG.

### 3. IDENTIFICATION CODES:

#### U.N. NUMBER:

STANDARD TRANSPORTATION COMMODITY CODE (STCC): These identification codes were provided in the Hazard Class General Information Section for each commodity with the specific information on that commodity as well as the DOT Emergency Response Guide Number. Additionally, the International Maritime Consultive Organization (IMCO) Code and the DOT Hazard Order were also provided. The UN number, STCC number, and DOT Emergency Response Guide Number should be included in the final HMSG but there is no reason for the inclusion of the IMCO number or the DOT Hazard Order. These latter two, if useful at all, are primarily applicable to emergency response situations.

4. BRIEF COMMODITY DESCRIPTION AND USE: The commodity description was provided in the Hazard Class General Information Section for each commodity as specific information on that commodity. The use of a commodity was not provided because of the extensive use many of these commodities can be put to in industry. This would have proven to be very lengthy as well as a major effort to research. Including use information in the final HMSG does not seem valid because this information does nothing to enhance the commodity's safe transport.

5. NATURE OF MAJOR HAZARDS IN ACCIDENT: This information was provided in two forms. One form pertained to the commodity itself and the hazards it posed by its existence. Basically the same properties by which it was defined as a hazardous material plus any additional hazardous properties the commodity may possess. This information was provided in the Hazard Class General Information Section for each commodity with the specific

information on that commodity. The second form was resident within the Emergency Response Information in each class section and related directly to accident/incident situations. In the final HMSG, the hazards of a particular commodity should be made known but not those that pose a threat in accidents as these are emergency situations.

6. SUMMARY OF EMERGENCY RESPONSE GUIDELINES: This information was provided in tabular format at the end of each Hazard Class Section. In light of the previous discussion regarding Emergency Response Information, it does not seem warranted to include this in the final HMSG.

7. AUTHORIZED DOT SPECIFICATION: Section I of the HMHG(P) provided a broad overview of those aspects of hazardous materials applicable to all commodities. Within this section, a detailed explanation of tank car specifications was provided. This general information is valuable and of use and should be retained in the final HMSG.

TANK CARS: The authorized DOT specification Tank cars were provided in the Hazard Class General Information Section for each commodity with the specific information on that commodity. This information consisted of listing those specifications which were authorized by the CFR for shipment of that commodity. Any qualifying parameters were also provided, i.e., maximum filling density, etc. Authorized specification tank cars of the same class and type will have a variety of pressure ratings. Therefore, if a 200 pounds per square inch gauge (psig) tank car was authorized, the 300, 400, 500 etc. psig higher rated versions were not listed. A statement to the effect that they were authorized was provided. This



information should be retained in the final HMSG.

OTHER RAIL CONTAINERS: Rail containers other than tank cars were not addressed in the HMSG(P). Scope definition will determine whether these other rail containers and packagings should be included in the final HMSG.

8. DOT REGULATORY REFERENCES (CFR LOCATIONS): These references were provided throughout the HMSG(P) as marginal information adjacent to the text material that was created by the reference. The final HMSG must have these references included in some form to enable the user to refer to the specific text for precise requirements and guidance when required or desired.

9. TANK CAR CONSTRUCTION SPECIAL FEATURES AND PROTECTIVE PACKAGING REQUIREMENTS: Construction features and requirements were addressed in Section I of the HMSG(P) for tank cars. Protective packaging requirements were not covered as these items did not relate to tank car shipments. Once the scope of coverage of the final HMSG is determined, the need for and depth of coverage for these items can then be determined.

10. CONTAINER, TANK CAR, AND COMPONENT TESTING REQUIREMENTS: The requirements for periodic testing were provided in Section I of the HMSG(P) in general terms. Greater detail on this subject will be required in the final HMSG and such coverage will lend itself to any selected format.

11. SPECIAL HANDLING PROVISIONS, EXEMPTIONS, AND EMERGENCY ORDERS IN EFFECT: The HMSG(P) addresses exemptions in

Section I, General Information on Hazardous Materials, and provides definitions and information on how and where to procure information on existing exemptions and orders. Special handling provisions were addressed in the Hazard Class Sections and, where applicable, in the commodity specific information. In the final HMSG it is important that these items of information be included but there will be some difficulty in doing so. In the "shipper's guide" format there should be no problem in addressing those special handling provisions that exist for a particular commodity. Exemptions and emergency orders may pose some difficulty due to the fact that (1) the HMSG's creation will be based on regulations as they exist at a given point in time while (2) exemptions and emergency orders are dynamic and can change daily. Therefore, any reference to these topics could prove to be incorrect on any given day. A means should be developed to enable the user to make inquiries regarding current status of these aspects as it relates to a particular commodity.

12. LOADING AND UNLOADING PRECAUTIONS AND REQUIREMENTS:

13. SHIPPING PAPER REQUIREMENTS:

14. MARKING AND PLACARDING REQUIREMENTS:

15. RESTRICTIONS ON POSITION OF CAR IN TRAIN:

16. INSPECTION REQUIREMENTS:

17. SWITCHING REQUIREMENTS:

18. DELIVERY AND STORAGE REQUIREMENTS:

19. EMPTY CONTAINERS, CARS, AND CLEANING REQUIREMENTS: All

of these topics were discussed in Section I of the HMHG(P). The depth of coverage was such that it addressed all hazardous materials in general. These items of information were not provided with the commodity specific information. The necessity for inclusion of these items of information in the final HMSG is obvious. The commonality

of much of this information could considerably increase the size of the final guide though. An appropriate mechanism should be developed to assist in the coverage of this information so that the guide can maintain its concise form.

20. MAJOR PROVISIONS/REFERENCES FOR TOFC/COFC, PORTABLE

TANK AND CARGO TANK SHIPMENTS: These items were not discussed in the HMHG(P) other than the acknowledgement of their existence and reference back to the CFR for the detailed provisions. Scope definition of the final HMSG will determine their future inclusion.

21. REPORTING OF INCIDENTS:

22. ORGANIZATIONS TO CONTACT FOR SPECIFIC INFORMATION:

These two topics were covered under the heading of "Incidents and Assistance" in Section I of the HMHG(P). Reporting of incidents should be addressed in the final HMSG in a manner that pertains to all hazardous materials. Organizations available for assistance should be covered as a hazard class item of information.

23. MAJOR PROVISIONS/REFERENCES FOR CANADIAN, INTERNATIONAL

AND SPECIAL SHIPMENTS: As a category of information these items were not specifically addressed. Provision was made for their inclusion as applicable for a specific commodity. The final HMSG should address these aspects on a commodity specific basis and as applicable for the defined scope (discussed further in Section V).

24. MAJOR RULEMAKING DOCKETS, CURRENT RULEMAKING AND/OR

RETROFITS IN PROGRESS: These subjects were not to be covered in the HMHG(P). The rationale was that "what might come to pass" did not impact on what were the current regulatory requirements. Once an item was approved/passed

it would be announced in the Federal Register and therefore outside the realm of consideration for the HMHG(P) production at a given point in time. Major rulemaking dockets and retrofits in progress regarding a class of authorized tank cars could be addressed in the appropriate section of the HMSG in general vice specific terms.

25. ADDITIONAL AAR OR BUREAU OF EXPLOSIVES REQUIREMENTS:

AAR and BOE material that has been incorporated by reference into the CFR was specifically identified. The specific items contained in this material were not addressed. As required/pertinent, this information should be included in the final HMSG.

26. ANNUAL RAIL TRAFFIC VOLUMES AND CHARACTERISTICS OVER THE LAST FIVE YEARS:

Not provided in the HMHG(P) because this information does not enhance the safety of hazardous materials transport by rail. This information would not enhance the final HMSG.

27. MAJOR ROUTES OF RAIL MOVEMENTS: Not provided in the HMHG(P) because this information does not enhance the safety of hazardous materials transport by rail. This information would not enhance the final HMSG.

28. MAJOR SHIPPERS AND CAR OWNERS: Not provided in the HMHG(P) because this information does not enhance the safety of hazardous materials transport by rail. This information would not enhance the final HMSG.

29. MAJOR PAST RAIL ACCIDENTS AND TRENDS: This material was not covered on a commodity specific basis but was provided in general terms under the heading of "Accidents and Their Prevention" in Section I of the HMHG(P). A

greater benefit could be provided to the user if this heading were changed to cover those most common areas of safety violations which have come to the attention of the DOT. Thereby, a mini-checklist of the key items to be aware of regarding a particular commodity could be highlighted.

30. OTHER SPECIAL NOTES AND/OR CLARIFICATIONS: As required, special notes and clarification were provided throughout the HMHG(P) and should be continued in the final HMSG.

#### Section V: Proposed Format

As discussed in the previous sections, there are a myriad of revisions to the scope, content, and format that would be required to accomplish all the desires of the evaluations. The following narrative, and the referenced appendices, offer one proposed alternative that would enable a viable Hazardous Material Shipper's Guide to be produced.

The core around which this format was built is the proposed information contained in the original shipper's guide concept (Appendix C). These items of information were reorganized to provide a logical flow of information and to eliminate redundancy as much as possible. The result of this reorganization generated the following general outline for the proposed HMSG:

#### HAZARDOUS MATERIAL SHIPPER'S GUIDE OUTLINE

1. Introduction (approx. one page)
  - a. Purpose
  - b. Objectives
  - c. Disclaimer
2. How to Use the HMSG (one or two pages)

3. General Information (applicable to all hazmats)
  - a. Information on CHEMTREC
  - b. Reporting of Incidents-21
  - c. Loading and Unloading Precautions & Requirements-12
  - d. Delivery & Storage Requirements-18
  - e. Restrictions on Position of the Car in the Train-15
  - f. Switching Requirements-17
  - g. Empty Containers & Cars and Cleaning Requirements-19
  - h. Shipping Paper Requirements-13
  - i. Inspection Requirements-16
  - j. Organizations to Contact for Specific Information-22
  - k. Major Provisions & References for Canadian, International, and Special Shipments-23
4. Numerical Listing of the UN/NA Numbers of the Commodities Contained in the HMSG
5. Alphabetical Listing of the Names of the Commodities Contained in the HMSG
6. Individual Hazard Class Sections (where all commodity specific information would be provided alphabetically by commodity, categorized by the commodity hazard class)
  - a. General Information (unique to the Hazard Class)
    - (1) Loading and Unloading Precautions and Requirements-12
    - (2) Delivery & Storage Requirements-18
    - (3) Restrictions on Position of the Car in the Train-15
    - (4) Switching Requirements-17
    - (5) Empty Containers & Cars and Cleaning Requirements-19
    - (6) Inspection Requirements-16
    - (7) Organizations to Contact for Specific Information
  - b. Specific Commodity Information (CFR References-8M- would be contained throughout this information)

- (1) Proper Shipping Name-**1M**
    - (a) Other Names-**1a**
  - (2) Hazard Class-**2M**
  - (3) Identification Codes-**3**
    - (a) DOT Emergency Response Guide Number
    - (b) UN Number-**3a**
    - (c) STCC Number-**3b**
  - (4) Brief Commodity Description-**4M**
  - (5) Nature of Major Hazards-**5M**
  - (6) Authorized DOT Specification for Tank Cars-**7a**
  - (7) Tank Car Construction Special Features-**9M**
  - (8) Special Handling Provisions-**11M**
  - (9) Marking and Placarding Requirements-**14**
  - (10) Major Past Safety Violations
  - (11) Other special Notes and/or Clarifications-**30**
  - (12) User Notes About the Commodity
7. Tank Car Specification and Test Requirements-**10M**
- a. Part I
    - (1) Explanation of Railroad Tank Car Specifications
    - (2) Tank Car Retrofits
    - (3) Authorized Canadian Tank Cars
    - (4) Explanation of Part II Contents
  - b. Part II
    - (1) Explanation of Each Tank Car Class
      - Specification for those addressed in the HMSG
    - (2) Explanation of Each Tank Car Specification for those Tank Cars addressed in the HMSG
8. Marking and Placarding Examples

Bold numbers above indicate original information item number from Appendix C. **M** reflects modification of original item. The remainder of this discussion outlines the general organization of the proposed HMSG. Appendix D is provided as an abbreviated sample to exemplify the manner of presentation and

organization. Appendix D is not complete with respect to the quantity of information that the HMSG would contain or its scope. Appendix D should be used as a tool to evaluate the proposed format, organization, and scope of subjects to be addressed and not to the degree to which they are addressed. Each of these major categories are discussed in detail in the following paragraphs.

1. Introduction: The introduction to the Hazardous Materials Shipper's Guide (HMSG) would state on one page, the Purpose and Objectives of the guide and provide a Disclaimer. The Disclaimer would basically state that the HMSG is not an authoritative document and that all final authority resides in the CFR.

2. How to Use the HMSG: One or two pages instructing the user how to use the guide. This would be styled much like the How to Use portion of the DOT ERG.

3. General Information: This section would address those items of information applicable to all hazardous materials. With the exception of item 3a., all the items of information identified above are directly from the original shipper's guide concept. Items 3b.-3k. are, with some exceptions, provided in the CFR in generic terms applicable to all hazardous materials. The individual hazard class/commodity exceptions would be cited in the Hazard Class General/Commodity Information sections. In this way, the length of the HMSG would be shortened considerably by not having to restate the same material with each commodity listed. Item 3j. would be categorized by (1) organizations that can provide information about all hazardous materials (e.g., BOE), and by (2), organizations that have a particular interest in a specific commodity or hazard class



(e.g., the Chlorine Institute, the National Liquefied Petroleum Gas Association, and the Compressed Gas Association).

4. Numerical Listing of the UN/NA Numbers of the Commodities Contained in the HMSG: This section would be an identification number index of the commodities contained in the HMSG much like the UN Number Index in the DOT ERG. The user who already knows the identification number of a commodity should have need for only the Proper Shipping Name of the material. Therefore, only the Proper Shipping Names of the commodities should be listed here, with the hazard class and the HMSG page numbers where the Hazard Class and commodity specific information can be located.

5. Alphabetical Listing of the Names of the Commodities contained in the HMSG: This section would list the variety of names that the commodities addressed in the HMSG are known by, i.e., the Proper Shipping Names, variations of Proper Shipping Names, and tradenames. Although listed by another name, information on a commodity would be found in the HMSG under its Proper Shipping Name. Included in this list would be those materials which are forbidden from being shipped by rail.

6. Individual Hazard Class Sections: These sections, one for each hazard class contained in the HMSG, are where all of the commodity specific information would be provided alphabetically by commodity in the shipper's guide format as well as pertinent information unique to a Hazard Class.

7. Tank Car Specification and Test Requirements: This section of the HMSG would have two parts. Part I would provide a General Explanation of Tank Car Specifications.

It would provide information on how to read a tank car specification and an explanation of the information contained in a specification. Included in this Part would be an explanation of retrofits in progress and those Canadian tank cars which are authorized for hazardous material transport use in the United States. Part II, Tank Car Class and Individual Car Specifications, would provide an explanation of the general specification for each tank car class cited in the HMSG. It would also provide a detailed explanation of each tank car specification cited as authorized for commodity use. The information contained here would be generic. Source material would be the CFR and the Manual of Standards and Recommended Practices Section C - Part III; Specifications for Tank Cars. A class specification would consist of those tank car characteristics common to the class while the car specification would be more detailed. Car and fittings' retest information would also be contained here. Those requirements that must be met to use a tank car for a particular commodity would be located with the commodity information.

8. Marking and Placarding Examples: Instead of providing examples of the marking and placarding requirements with the commodity information, a complete set of these requirements would be provided in one section of the HMSG. The user would be referred from the commodity section to particular example(s) contained in this section. In this way production costs of the HMSG would be reduced by having the majority, if not all, the requirements for color printing contained in one section vice color being required throughout the commodity information sections.

The following general scenario depicts how the guide would

be used. The page numbers of Appendix D will be used for reference.

The user of the HMSG wants to know the requirements for safe transport as well as what railroad tank cars can be used to ship ethylene oxide. After reading "How to Use the HMSG" (D3-D4) and the "General Information on All Hazardous Materials" (D5-D19) sections of the guide, they then locate "ETHYLENE OXIDE" (D33). There they are provided with the UN Number (UN1040), the Hazard Class (FL: Flammable Liquid), and the page numbers of the guide where Flammable Liquid Hazard Class and ethylene oxide information is provided (D47 & D50). Had the user known the UN Number initially, they could have gone to the "UN/NA Number Listing" (D20) and found the same information. Had the user known ethylene oxide by the name "OXIRANE", they would have used the same "Alphabetical Listing", located "OXIRANE" (D40) and been referred to ethylene oxide.

The user then turns to page D47. Here they are provided with information regarding the safe transport requirements applicable to all Flammable Liquids as well as any requirements unique to Flammable Liquids. The user then continues on to page D50. Here they find the information and requirements pertinent to "ETHYLENE OXIDE." Under the sub-heading "AUTHORIZED DOT SPECIFICATION FOR TANK CARS" the user is informed that DOT105A100W and DOT111A100W4 tank cars are authorized and is referred to the "Tank Car Specification and Test Requirements" section of the guide. Part I of this section explains what these specifications mean (D54). Part II provides the user with a description of the DOT105A (D58) and DOT111A (D59) classes of tank cars as well as the particular construction features of the authorized specifications.

Now that the user knows the details of the authorized tank

cars, they return to page D51. Under the sub-heading "TANK CAR CONSTRUCTION FEATURES FOR ETHYLENE OXIDE" the user is provided with the detailed requirements that a tank car must meet for safe transport. The user, now aware that DOT105A100W tank cars may or may not be equipped with excess flow valves (D58), is now informed that it is a requirement that tank cars used for ethylene oxide service MUST be equipped with excess flow valves. Item by item the user can now determine the exact tank car that must be procured as well as the other requirements that must be met for the safe transport of ethylene oxide.

Under the sub-heading "MARKING AND PLACARDING REQUIREMENTS" (D53) the user is informed as to how the tank car must be marked and placarded. They are then referred to "Marking and Placarding" section example number 2. On that page (D60) the user is provided with a graphic examples of how the car must be placarded. Should the user require more specific information, the CFR references are provided throughout the commodity information section.

The examples presented above are but one alternative of many for the presentation of information and requirements concerning the safe transport of hazardous materials. This concept is viable for the achievement of the desired objectives and the format can be tailored to meet specific requirements, restrictions, and precise scope definition. The format proposed also incorporates, to a large extent, the desires and recommendations of the HMMHG(P) evaluation regarding presentation of material. Scope definition, project management, and considerations for the implementation of the Hazardous Materials Shipper's Guide are discussed in the following section.

## Section VI: Project Development and Recommendations.

### Recommendations:

Based upon the information presented in the previous sections of this report, the following "prescription" for the Hazardous Materials Shipper's Guide is offered:

1. The guide should not contain any emergency response guidance. It should provide the DOT Emergency Response Guide Number and identify the basic hazards of the commodity.

2. The guide should be in shipper's guide format in a manner similar to Appendix D (or slightly modified to meet requirements).

3. The guide should address a "percentage" number of commodities. A percentage number would represent the volume of tank car units of hazardous materials transported by rail. Once determined, the BOE can identify the precise number of commodities this entails. Appendix D lists 112 commodities. These 112 hazardous materials represent approximately 83% of the total number of carloads of hazardous materials transported on U.S. railroads during 1983 (Source: BOE).

4. The guide should address only tank car shipments at this point in time.

5. The first edition of the guide should be a one volume compendium identical to the size and specifications of the DOT Emergency Response Guide.

6. The information contained in the guide should be written according to the ETLC system and a reading comprehension level

between the 10th and 11th grade.

Justification:

Items 1 and 2 above are based on the unanimous consensus of the evaluations and therefore need little justification. The need for such a guide exists and, with its revised scope, these two requirements are easily accommodated.

Justification for items 3 - 5 above is more programmatic. The number of commodities selected is basically the starting point, as is the restriction of mode to tank cars only. These two items will provide a guide of sufficient scope and depth to be highly viable. To produce a guide with this scope is, in effect, a test to gain future guidance. A test that actually goes out into the public sector and is useful while being tested. The one volume compendium was selected because the quantity of information on a finite number of materials and the tank cars which transport them lends itself to a guide of that size. While the first edition of the guide is "in the field," comments from the users can be collected and analyzed. The users would then have input as to what the second edition should cover that the first edition did not, i.e., other modes of transport/ packagings or additional commodities. The second edition can be tailored to fill the information void in the public sector. With this methodology, the first edition can be produced and distributed earlier and at a lower cost. It would be expensive to produce a first edition covering 3000 materials and all modes of transport in 16 volumes only to find out later that the public was only concerned about a fraction of that scope. In this way, the scope will grow with the need. If, however, it is desired to cover a larger number of commodities or additional modes of transport, the guide should then be produced in a multi-volume form with the same proposed format and depth of coverage.

Item 6 above is a recommendation that would enhance the guide's ability to be "user friendly" and incorporate the optimal human factors.

### Project Development

The contractor realizes that several offices within the Department of Transportation have an interest in the creation of the Hazardous Materials Shipper's Guide. Once concurrence by these offices can be acquired on scope, format, content, form, and funding, the contractor is prepared to initiate work according to the following major work tasks:

1. Establish the initial commodity information data base in a form suitable for future expansion and revision.
2. Thoroughly research the Code of Federal Regulations for all portions which apply to the commodities identified and the selected mode of transport.
3. Develop a complete draft of the entire guide and obtain expert technical concurrence on the material contained therein.
4. Redraft the guide by means of the ETLC system according to desired criteria.
5. Provide a reproducible manuscript from which the guide may be produced according to desired specifications.
6. Maintain the CFR and commodity data bases as well as conduct an ongoing analysis of user comments to enhance the guide's future revisions.

APPENDIX A

HMHG CONCEPT EVALUATION SURVEY

NOTE: The Hazardous Material Handling Guide (Preliminary) is a strawman. It does not reflect final scope, content, style or format. Should space not permit, please annotate continuation on back of sheet.

1. Are there valid requirements for a Hazardous Material Handling Guide (HMHG)?

☐ Yes.

☐ Use within FEMA.

☐ Use by other Federal agencies and field activities. (Specify): \_\_\_\_\_

☐ Use by local activities (e.g., fire departments, police agencies). (Specify): \_\_\_\_\_

☐ Use by commercial activities (e.g., shippers, transporters, etc.). (Specify): \_\_\_\_\_

☐ Other. (Specify): \_\_\_\_\_

☐ No.

Comments: \_\_\_\_\_

NOTE: Answer the following questions assuming there is a need for the HMHG.

2. Will the HMHG concept achieve its desired objectives?

Yes. (Comment): \_\_\_\_\_

No. (Comment): \_\_\_\_\_



3. What audience should the HMMHG address? Those with:

- ☐ an 8th - 11th grade education.
- ☐ a High School Diploma.
- ☐ a post high school education.
- ☐ some knowledge of hazardous materials.
- ☐ no knowledge of hazardous materials.

Describe the envisioned typical user: \_\_\_\_\_

Comments: \_\_\_\_\_

4. What format should the HMMHG take?

- ☐ One complete volume for all addressed commodities.
- ☐ A series of volumes covering specific subjects (e.g., flammable gases, non-flammable gases, corrosives, and other HAZMAT Classes).
- ☐ Other. (Specify): \_\_\_\_\_

Comments: \_\_\_\_\_

5. What should the scope of the HMMHG be?

- ☐ Cover the total scope of commodities as in the preliminary HMMHG. (Comment): \_\_\_\_\_
- ☐ Cover the 100 or so commodities that constitute 95% of the bulk rail transport of Hazardous Materials. (Comment): \_\_\_\_\_
- ☐ Address all means of rail transport, or limit to tank cars (e.g., corrosives can be carried in hopper cars, explosives can be carried in boxcars, and flammable gases can be carried in cylinders on almost any railroad vehicle). (Comment): \_\_\_\_\_
- ☐ Add the following subjects. (Specify): \_\_\_\_\_
- ☐ Delete the following subjects. (Specify): \_\_\_\_\_

☐ Be more detailed in treatment. (Comments): \_\_\_\_\_

☐ Be less detailed in treatment. (Comment): \_\_\_\_\_

Other comments: \_\_\_\_\_

6. What are your likes/dislikes concerning the HMHG?

Like: \_\_\_\_\_

Dislike: \_\_\_\_\_

7. Portions of the preliminary HMHG are written in the controlled (simplified) language, ETLC. This was explained in the briefing. Do you prefer the ETLC style? (A comparative example of the original CFR text, Encl. 1, and its equivalent ETLC text, Encl. 2, are attached.)

- ☐ Yes, prefer ETLC.
- ☐ No, prefer CFR style.
- ☐ Prefer a compromise of both.

Do you prefer the prose or "bullet" style of ETLC?

- ☐ Prose (Encl. 3)
- ☐ "Bullet" (Encl. 2)

Comments: \_\_\_\_\_

Other comments (e.g. adequate illustrations, graphics, etc.)? \_\_\_\_\_

8. At what frequency should the HMHG be updated?

- ☐ Annually.
- ☐ When CFR changes.
- ☐ As new commodity information becomes available and/or procedures dictate.
- ☐ Other. (Specify): \_\_\_\_\_

9. Additional recommendations for improvement?

Specify: \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

10. Describe yourself:

Position of interest in HAZMAT transport by rail. \_\_\_\_\_  
\_\_\_\_\_

Education level: \_\_\_\_\_  
\_\_\_\_\_

Other viable information: \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

Signature (optional)

\_\_\_\_\_

### 173.300 Definitions.

For the purpose of Parts 170-189 of this subchapter, the following terminology is defined:

(a) Compressed gas. The term "compressed gas" shall designate any material or mixture having in the container an absolute pressure exceeding 40 p.s.i. at 70 F. or, regardless of the pressure at 70 F., having an absolute pressure exceeding 104 p.s.i. at 130 F.; or any liquid flammable material having a vapor pressure exceeding 40 p.s.i. absolute at 100 F. as determined by ASTM Test D-323.

(b) Flammable compressed gas. Any compressed gas as defined in paragraph (a) of this section shall be classed as "flammable gas" if any one of the following occurs:

(1) Either a mixture of 13 percent or less (by volume) with air forms a flammable mixture or the flammable range with air is wider than 12 percent regardless of the lower limit. These limits shall be determined at atmospheric temperature and pressure. The method of sampling and test procedure shall be acceptable to the Bureau of Explosives and approved by the Associate Director for HMR.

(2) Using the Bureau of Explosives' Flame Projection Apparatus (see Note 1), the flame projects more than 18 inches beyond the ignition source with the valve opened fully, or, the flame flashes back and burns at the valve with any degree of valve opening.

(3) Using the Bureau of Explosives' Open Drum Apparatus (see Note 1), there is any significant propagation of flame away from the ignition source.

(4) Using the Bureau of Explosives' Closed Drum Apparatus (see Note 1), there is any explosion of the vapor-air mixture in the drum.

Note 1: A description of the Bureau of Explosives' Flame Projection Apparatus, Open Drum Apparatus, Closed Drum Apparatus, and method of tests may be procured from the Bureau of Explosives.

Enclosure (1)

## **DEFINITION**

A flammable gas is a compressed gas. It meets one of the following prescribed criteria for a compressed gas:

- (1) Vapor pressure exceeds 40 PSIA at 70 F.
- (2) Vapor pressure exceeds 104 PSIA at 130 F.
- (3) Liquid flammable material with vapor pressure of more than 40 PSIA at 100 F.

Any compressed gas is a "Flammable Gas" if:

- o A mixture of 13% or less with air forms a flammable mixture.
- o The flammable range with air is greater than 12%.

## **NOTE**

**THE CFR CONTAINS CERTAIN OTHER TECHNICAL CRITERIA**

## EXPLANATION OF RAILROAD CAR SPECIFICATIONS

DOT authorizes a wide variety of tank cars for use in the shipment of Hazardous Materials. You must determine the type of tank cars authorized for use in shipping a particular commodity. Consult the appropriate section of the CFR for the commodity or commodity class. The CFR provides authorized cars in a specification format. The CFR also provides authorization for older tank cars. The following information provides a guide for tank car specification formats.

## APPENDIX B

### HMHG CONCEPT EVALUATION SURVEY

**NOTE:** The Hazardous Material Handling Guide (Preliminary) is a strawman. It does not reflect final scope, content, style or format. Should space not permit, please annotate continuation on back of sheet.

**1. Are there valid requirements for a Hazardous Material Handling Guide (HMHG)?**

**1A 3/4 Yes.**

**1A1** Comment on the above question: "If FRA returns back to original work scope of producing shippers guides - If not abandon project because this book (the HMHG) tries to do too much and does it badly. Rest of (my) responses are only valid for shippers guide approach." (BOE)

**1B 1/4 Use within FEMA.**

**1B1** Comment on the above question: "FEMA probably not (the) best audience." (BOE)

**1C 2/4 Use by other Federal agencies and field activities.**

**1C1** "There is a need for a standardized guide in the methods of handling hazardous materials to be used by all personnel and agencies dealing with and regulating hazardous materials." (FEMA)

**1C2** "Federal Inspectors of hazmat shipments and loading/unloading facilities." (BOE)

**1D 3/4 Use by local activities (e.g., fire departments, police agencies). (Specify):**

**1D1** "Could help in enforcement work." (BOE)

**1D2** ".....a standardized guide is needed by all personnel involved with hazardous materials whether it is Federal, State or local agencies." (FEMA)

**1D3** "State and local groups charged with protecting (the) public through periodic inspections of hazmat facilities and carriers' vehicles would benefit from a document outlining the applicable regulations for each commodity. As written this document does provide some very useful and usable information, but it could go further in simplifying the regulations. There are other emergency response books out there (in the public sector). This (the HMHG) is, frankly, poor by comparison to some of these. The main area where no

one has contributed a useful document in suming (up) the appropriate regulations for each commodity or group of commodities. FRA can provide a badly needed document by returning to its original scope of work. I have attached what I believed to be the scope of this effort. If FRA returns to the original scope of work this guide would provide state and local officials a condensed tool to use when inspecting, enforcing, or planning response to hazmat facilities and transport vehicles." (BOE)

**1E 3/4 Use by commercial activities (e.g., shippers, transporters, etc.). (Specify):**

- 1E1 "Could be useful to help shipper consult a single source rather than many sections of (the) CFR." (BOE)
- 1E2 "Anything that can be done to simplify the 49 CFR to enable shippers to decode would be great. There is a crying need to simplify this document." (BOE)
- 1E3 "A shippers guide would provide chemical manufacturers and shippers with a consolidated guide to appropriate regulations." (BOE)
- 1E4 Comment on the above question: "No. Commercial shippers, transporters, etc., should use the CFR 49 which is more detailed than a handling guide would be able to condense for use by private industry." (FEMA)

**1F 1/4 Other. (Specify):**

- 1F1 "FRA and DOT Inspectors." (BOE)

**1G 1/4 No.**

- 1G1 "If book (HMHG) retains current direction. It (the HMHG) tries to accomplish too much. No need to duplicate DOT's Emergency Response Guidebook - if response is desired, sell/distribute as a 2 vol. set." (BOE)

**1H Comments:**

- 1H1 (In response to Question 1 in general) "Not as currently formatted!! - attempts too much in one volume." (BOE)

**NOTE:** Answer the following questions assuming there is a need for the HMHG.

**2. Will the HMHG concept achieve its desired objectives?**

- 2-1 Comment on the above question: "It is unclear what (the) desired objectives are for the HMHG. I thought it was to provide a type of shippers guide for DOT regulated



commodities. This book tries to do all - shippers guide to regulated and non-regulated commodities, emergency response, etc. (It) would be better to focus on a defined area and do a better job than to try to do too much." (BOE)

2A **Yes. (Comment):** (No responses to this answer)

2B **No. (Comment):**

2B1 "As it currently exists, the guide attempts too much and takes too long to access. (I simulated an emergency and had to check 3 or 4 sections to get \_\_\_\_\_ the recommendations.)" (BOE)

2B2 "Scope too broad. I don't believe this (the HMHG) can be or should be all things to all people. If you want to publish an emergency response manual, do so. If you want to simplify the 49 CFR for shippers, do so. An all encompassing document is next to impossible." (BOE)

3. **What audience should the HMHG address? Those with:**

3A1 3/4 an 8th - 11th grade education.

3A2 1/4 a High School Diploma.

3A3 0/4 a post high school education.

3A4 1/4 some knowledge of hazardous materials.

3A5 2/4 no knowledge of hazardous materials. (Comment: or limited knowledge) (BOE)

3B **Describe the envisioned typical user:**

3B1 "Shipper employee, some use by carrier employee, 'handy reference' for regulatory enforcer." (BOE)

3B2 "Difficult to define user when the scope of the document isn't defined. I would guess that most emergency response people have at least an 11th grade education as would most shipping managers or loading rack personnel." (BOE)

3B3 "First emergency response personnel (e.g., fire department, police agencies, emergency medical personnel, training personnel.)" (FEMA)

3B4 "The most beneficial user is the industry person who is charged with complying with the DOT regulations but who is lost when faced with reading 49 CFR. This would include manufacturers, warehouse operations, container manufacturers, and those who specify labels, packagings, and other marks. The second user could be the state and local regulators who enforce the haz(ardous) material regulations. These folks are not all hazmat professionals and could benefit from a guidebook to simplify the fed(eral) regulations." (BOE)

3B5 "Because of the complexity of the subject matter, (the) user should be familiar with hazmat either from educational background or work experience." (FEMA)

**4. What format should the HMHG take?**

- 4A1 1/4 One complete volume for all addressed commodities.  
4A2 1/4 A series of volumes covering specific subjects (e.g., flammable gases, non-flammable gases, corrosives, and other HAZMAT Classes).  
4A3 1/4 Other. (Specify): "Either one complete volume or a series of volumes. The format is not as important to me (one volume, two or more volumes) as is the content of the document." (BOE)

**4B Comments:**

- 4B1 "Outside of classroom situations, a one-volume compendium is preferable for reference material, especially in such situations as fire companies or police situations. More than one volume is too cumbersome." (FEMA)  
4B2 "Individual volumes would meet a need to cover that '5%' that the larger manual neglects and some feel (for) is necessary. They would be easier, 'cheaper' to update and people could order just the ones they want." (BOE)  
4B3 "Original concept was to have major commodities treated on a one or two page info(rmation) sheet so (the) shipper could go to one guide rather than several CFR sections. That was a good idea." (BOE)

**5. What should the scope of the HMHG be?**

- 5A 2/4 Cover the total scope of commodities as in the preliminary HMHG. (Comment):  
5A1 "Cover as many as possible, it is always the one deleted (omitted) that poses a problem." (FEMA)  
5A2 "In order for any shipper guidebook to be useful it needs to address all DOT regulated commodities." (BOE)  
5A3 "NO! Have (only) major commodities treated." (BOE)  
5B 1/4 Cover the 100 or so commodities that constitute 95% of the bulk rail transport of Hazardous Materials. (Comment):  
5B1 "See new BOE publication 'Emergency Action Guides' for emergency response info - no need for DOT to duplicate - but could use shipper guidebook to complement." (BOE)  
5C 4/4 Address all means of rail transport, or limit to tank cars (e.g., corrosives can be carried in hopper cars, explosives can be carried in boxcars, and flammable gases can be carried in cylinders on almost any railroad vehicle). (Comment):

- 5C1 "Address all means of rail transport as there are problems in all areas of hazardous material handling." (FEMA)
- 5C2 "All types of packaging that can move on rail should be addressed." (BOE)
- 5C3 "TOFC/COFC - all rail - not just tank cars." (BOE)
- 5C4 "These areas have to be confronted. You can't limit yourself to just tank cars. TOFC/COFC is consistantly growing and shippers are pushing to move hazmat in intermodal service." (BOE)
- 5D1 Comment: (in reference to the following four questions): "General execution in present format too soon to make these detailed comments." (BOE)

**5E 2/4 Add the following subjects. (Specify):**

- 5E1 "Address all of the commodities listed in the Bureau of Explosives Association of American Railroads Manual Titled, 'Emergency Handling of Hazardous Materials.'" (FEMA)
- 5E2 "Add other packagings (we) may see in rail movements." (BOE)
- 5E3 "List forbidden materials; by excluding these, some shippers may assume (that they are) non-regulated!" (BOE)
- 5E4 "Add alternate placard to shipping information for each class (pg 84)." (BOE)
- 5E5 "Discuss car stenciling marks and what they mean in Section 1." (BOE)
- 5E6 "To references, add Block and Brace Requirements in 6C (in process of revisions) by AAR/BOE." (BOE)
- 5E7 "Add block and brace discussion to Section 1 and refer to above." (document in 5E6 above) (BOE)

**5F 1/4 Delete the following subjects. (Specify):**

- 5F1 "Sect 1 - hazard order, pg 4, 5 - no relation to IMDG code - may be confusing." (BOE)
- 5F2 "Delete all NR (non-regulated) commodities. Why are they included here in the first place? If these commodities are not regulated by the DOT by either specific listing or by defination (?), then they fall out of the DOT system as we currently know it. The attention of this document should be focused on regulated commodities only." (BOE)
- 5F3 "Delete all DOT emergency response info - e.g. pgs 113-116, (and) also delete these page nos. from (UN) ID index and (on inside) back page." (BOE)

**5G 1/4 Be more detailed in treatment. (Comments):**

- 5G1 "49 CFR regulations." (BOE)

5H 1/4 Be less detailed in treatment. (Comment):

5H1 "Do not like idea of redoing DOT's Emergency Response Guidebook - Just include as part of document (2nd volume) and use ERG as is printed. Do NOT like presentation (pgs 113-116 for example ) of ERG in this book." (BOE)

5I Other comments:

5I1 "Pg. 15, #7 number designation indicates lining of tank car, insulation, etc., (therefore) delete words 'no special significance.'" (BOE)

5I2 "Change incorrect thought pg. 13 'A' is of no significance. See pg C-III-8 (of AAR Manual of Standards and Recommended Practices, Specifications for Tank Cars)." (BOE)

5I3 "Figure 2 pg 19 is confusing - eliminate arrows." (BOE)

5I4 "Pg. 19 - add (reference) 172.334 - poison gas, radioactive (materials) and explosive cannot have UN NOS on placard." (BOE)

5I5 "Throughout book put references on outside edge of all pgs." (BOE)

5I6 "Present alpha(betical) index to each class (section) in another format - The block format (lines) is not easily used; Rather use format typical for table of contents (no lines)." (BOE)

6. What are your likes/dislikes concerning the HMHG?

6A Like:

6A1 "Simplification of 49 CFR." (BOE)

6A2 "Good Index Tabs." (BOE)

6A3 "The explanation of Rail Car Specifications as listed in Section III through XVIII." (FEMA)

6A4 "The division of the different sections is very good; however, the tabs should be made of a permanent material." (FEMA)

6A5 "Like the quick reference material for aversion of potential disaster situations that includes the majority of hazmats that affect a community." (FEMA)

6B Dislike:

6B1 "Format; too complicated for the average person. For someone that would use the volume every day, no problem because of familiarity. An occasional user would be confused or unable to answer questions quickly." (FEMA)

6B2 "The lack of attention to service provided by CHEMTREC." (BOE)

6B3 "The all encompassing 'shotgun' approach to cover everything." (BOE)

- 6B4 "Writing very poor - unclear - hard to pull info(rmation) out of (the) paragraphs." (BOE)  
6B5 "Too much is attempted (in the HMMG)." (BOE)  
6B6 "Dislike intensely (the) use of DOT Emergency Response Guidebook presentation. Just refer (the) user to (the) ERG - don't duplicate it!" (BOE)

**7. Portions of the preliminary HMMG are written in the controlled (simplified) language, ETLC. This was explained in the briefing.**

**7A Do you prefer the ETLC style?**

- 7A1 1/4 Yes, prefer ETLC.  
7A2 0/4 No, prefer CFR style.  
7A3 3/4 Prefer a compromise of both.  
7A4 Comment on the above question: "ETLC is either a crock - or hasn't been given a chance."

**7B Do you prefer the prose or "bullet" style of ETLC?**

- 7B1 0/4 Prose  
7B2 3/4 "Bullet"  
7B3 Comment on the above question: "Depends on the materials being presented."

**7C Comments:**

- 7C1 "Because of the volume of material involved, in both educational and user (day-to-day) situations, concise and precise language is preferable for rapid digestion." (FEMA)  
7C2 "In some cases the use of ETLC style is too simple - need to rewrite. For example pg 16 'special requirements.' In my opinion, (the) paragraph ties too many thoughts in a sentence without a topic sentence. The result is very unclear and too general." (BOE)  
7C3 (Either ETLC or "bullet" style) "Draws attention to each subject." (BOE)  
7C4 "If the 'guide' is intended for general applicability, the language must be made more concise and precise. Of the examples furnished, the ETLC style appears to be the option I would choose, simply because the more wordy a publication of this nature, the more likely it is to confuse the reader." (FEMA)

**7D Other comments (e.g. adequate illustrations, graphics, etc.)?**

- 7D1 "Admittedly a rough draft, but this type font is hard to read." (BOE)

**8. At what frequency should the HMHG be updated?**

- 8A 1/4 Annually.
- 8B 0/4 When CFR changes.
- 8C 1/4 As new commodity information becomes available and/or procedures dictate.
- 8D 2/4 Other. (Specify):
- 8D1 "Suggest putting commodity specific info in looseleaf format so (originator) can update book selectively as needed." (BOE)
- 8D2 "If you are going to list proper shipping names, STC Codes, etc., you must update whenever (the) CFR changes. You also are under an obligation to provide new commodity info on old and new commodities as new shipping names are added." (BOE)

**9. Additional recommendations for improvement? Specify:**

- 9A "Go back to original concept - a shippers guide - stay out of (the) emergency response field." (BOE)
- 9B "Focus on needed book - do not try to incorporate all emergency response into (the) book. Fill the needs of the regulated community and regulations enforcers to simplify and, where possible, clarify DOT regulations about DOT regulated commodities." (BOE)
- 9C "Reader level should be held at 6th grade level. Technical materials are difficult for the reader outside the field of study. In addition, for the average user, a simplified format would be in order (e.g., an alphabetical listing of hazmats followed by a 1, 2, 3 code system that would quickly zero-in on substance qualities and dangers, procedures to be followed, etc.) The present (class section) listing which in many cases reads 'see....' is confusing and reads like a tax instruction." (FEMA)
- 9D "The (directly) above comments reflect a concern that the manual is too complicated in format and language. As it stands, only a very few hazmat-oriented professionals would truly benefit from the presentation. Should the text be intended for use by a myriad of groups that would participate in hazmat situations, a revision would be needed." (FEMA)
- 9E "Overall, the guide is helpful in linking CFR and hazardous materials information with railroad transportation requirements for handling, packaging, etc., of rail cars. Any guide that organizes this type of information in a more useful form is needed." (FEMA)
- 9F "The guide should be more substance specific. The user should be able to identify all applicable requirements for his particular commodity." (FRA SAFETY)
- 9G "MTB already has published a How To Use The Regulations Publication - back in 1977. This pamphlet is being updated

and is more convenient. A rail section can be added as a general example." (FRA SAFETY)

9H "If (the HMHG is) carrier related - All train crews are issued a timetable which includes excerpts directly from the regulations in pocket format." (FRA SAFETY)

9I "The BOE (AAR) also has publications for train crews and bill clerks that are distributed by the railroads to their employees." (FRA SAFETY)

9J "(The HMHG) Appears to be duplication between FRA (R&D), MTB, and the BOE (efforts). (FRA SAFETY)

9K "Give tank car/container details for each commodity, i.e., material (of construction) of car, coupler, head shield, thermal insulation, valves, bottom outlets, (inspection requirements) etc." (FRA SAFETY)

## **10. Describe yourself:**

### **10A Position of interest in HAZMAT transport by rail.**

10A1 Director - Bureau of Explosives. In charge of industry's association dealing with hazardous materials.

10A2 Employed by rail trade association. (I) work for safe transportation of hazmat by rail. (I) maintain (a) hazmat incident data base for rail. (I) provide hazmat info and emergency response (info) for (the) railroads.

10A3 Employed by AAR - responsible for scientific information; provide technical assistance to carriers, shippers, community about hazmat; attend derailments when requested by railroad

10A4 (Deputy Associate Administrator for Safety, FRA)

10A5 (Chief, Operating Practices Division, FRA Safety)

10A6 (Emergency Management Officer, Tech Hazards Div, FEMA)

### **10B Education level:**

10B1 Post graduate degree

10B2 College graduate, degree in economics, 1 year post graduate work in data processing

10B3 BS Biology/Chemistry; post graduate courses; certified wastewater operator; attended many hazmat response courses.

10B4 (THREE, NO COMMENT)

### **10C Other viable information:**

10C1 Have been employed as government consultant for Washington, D.C. area firm; have worked for bulk distributor (in field), motor carrier, and railroad association.

10C2 (FIVE, NO COMMENT)

## APPENDIX C

### PROPOSED INFORMATION FOR EACH COMMODITY

The following list contains those items of information originally proffered as those desired to be part of a "shipper's guide.

1. COMMODITY NAME:
  - OTHER NAMES:
  - CHEMICAL SYMBOLS:
2. CLASSIFICATION (HAZARD CLASS):
3. IDENTIFICATION CODES:
  - U.N. NUMBER:
  - STANDARD TRANSPORTATION COMMODITY CODE (STCC):
4. BRIEF COMMODITY DESCRIPTION AND USE:
5. NATURE OF MAJOR HAZARDS IN ACCIDENT:
6. SUMMARY OF EMERGENCY RESPONSE GUIDELINES:
7. AUTHORIZED DOT SPECIFICATION:
  - TANK CARS:
  - OTHER RAIL CONTAINERS:
8. DOT REGULATORY REFERENCES (CFR LOCATIONS):
9. TANK CAR CONSTRUCTION SPECIAL FEATURES AND PROTECTIVE PACKAGING REQUIREMENTS:
10. CONTAINER, TANK CAR, AND COMPONENT TESTING REQUIREMENTS:
11. SPECIAL HANDLING PROVISIONS, EXEMPTIONS, AND EMERGENCY ORDERS IN EFFECT:
12. LOADING AND UNLOADING PRECAUTIONS AND REQUIREMENTS:
13. SHIPPING PAPER REQUIREMENTS:
14. MARKING AND PLACARDING REQUIREMENTS:
15. RESTRICTIONS ON POSITION OF CAR IN TRAIN:
16. INSPECTION REQUIREMENTS:
17. SWITCHING REQUIREMENTS:
18. DELIVERY AND STORAGE REQUIREMENTS:
19. EMPTY CONTAINERS, CARS, AND CLEANING REQUIREMENTS:



20. MAJOR PROVISIONS/REFERENCES FOR TOFC/COFC, PORTABLE TANK AND CARGO TANK SHIPMENTS:
21. REPORTING OF INCIDENTS:
22. ORGANIZATIONS TO CONTACT FOR SPECIFIC INFORMATION:
23. MAJOR PROVISIONS/REFERENCES FOR CANADIAN, INTERNATIONAL AND SPECIAL SHIPMENTS:
24. MAJOR RULEMAKING DOCKETS, CURRENT RULEMAKING AND/OR RETROFITS IN PROGRESS:
25. ADDITIONAL AAR OR BUREAU OF EXPLOSIVES REQUIREMENTS:
26. ANNUAL RAIL TRAFFIC VOLUMES AND CHARACTERISTICS OVER THE LAST FIVE YEARS:
27. MAJOR ROUTES OF RAIL MOVEMENTS:
28. MAJOR SHIPPERS AND CAR OWNERS:
29. MAJOR PAST RAIL ACCIDENTS AND TRENDS:
30. OTHER SPECIAL NOTES AND/OR CLARIFICATIONS:

## **APPENDIX D**

### **SAMPLE OF A PROPOSED**

### **HAZARDOUS MATERIALS SHIPPER'S GUIDE**

## SAMPLE INTRODUCTION

The objective of the Hazardous Material Shipper's Guide (HMSG) is to promote the **SAFE TRANSPORT** of Hazardous Materials by rail. To achieve this, the regulations and information contained in the Code of Federal Regulations (CFR) and other sources have been simplified and reorganized to enable the user to locate all pertinent information about a material in one location. The HMSG is not an authoritative, regulatory document. Its sources are both regulatory and advisory. Use the HMSG only for guidance. Check specific information with the latest edition of the CFR or the Federal Register (FR). Rules governing the transport of hazardous materials change frequently. Each edition of the HMSG has a useful life of two to three years. Contact the Superintendent of Documents, Washington, D.C., to order the CFR or FR.

HOW TO USE THIS GUIDEBOOK  
(SAMPLE)

FIRST: Read "General Information for Shipping All Hazardous Materials" (D5) if you are not completely familiar with that section's contents.

SECOND: Locate information regarding the Hazard Class and the Hazardous Material to be transported by:

- the UN/NA Identification Number in the numerical listing in the **GOLD** pages of the guidebook

- OR -

- the name of the material in the alphabetical listing in the **GREEN** pages of the guidebook

**IF YOU DO NOT FIND A LISTING FOR YOUR MATERIAL IN EITHER LOCATION SEE NOTE 1.**

THIRD: In either the **GOLD** or **GREEN** sections, the following information will be provided:

- the name of the material (Proper Shipping Name or Other Name)
- the UN/NA number
- the Hazard Class of the material

**-AND-**

- two page numbers of the guidebook where:

- the first page number provides the location of general information about transport of that material's Hazard Class **WHICH MUST BE READ FIRST.**

- the second page number provides the location of specific information regarding transport of the material. This section on material information will refer you to additional sections of the guidebook.

NOTE 1: If you do not find your material in either listing of this guidebook then you are dealing with a Hazardous Material which is rarely transported in bulk by rail tank car. The HMSG has not attempted to address all Hazardous Materials transported by rail but only those commodities which constitute 98% of the bulk rail tank car volume. Should you need assistance, contact the Department of Transportation (DOT) at XXX-XXX-XXXX or the Association of American Railroads at YYY-YYY-YYYY.

GENERAL INFORMATION  
FOR SHIPPING ALL HAZARDOUS MATERIALS

CHEMTREC

FOR CHEMICAL EMERGENCY  
Spill, Leak, Fire, Exposure, or Accident  
CALL CHEMTREC - DAY OR NIGHT  
1-800-424-9300

CHEMTREC, the Chemical Transportation Emergency Center, provides information and/or assistance to those involved in or responding to chemical or hazardous material emergencies. Established in 1971, it is a public service of the Chemical Manufacturers Association (CMA) in Washington, D.C.

CHEMTREC operates in two stages: First, on receipt of information regarding the name of a chemical, it provides immediate advice on the nature of the product and steps to be taken in handling the early stages of a problem. Second, CHEMTREC promptly contacts the shipper of the material involved for more detailed information and appropriate follow-up, including on-scene assistance when feasible.

While the Center's primary mission is to help in transportation incidents, it also provides support in chemical and hazardous materials emergencies in non-transportation situations.

CHEMTREC operates 24 hours a day, seven days a week to receive calls. The number is widely circulated in professional literature and is distributed to emergency service personnel, carriers, the chemical industry, bulletins of government agencies, trade associations and others who may have need.

**CHEMTREC** is not a reporting center. The Department of Transportation handles this function.

**CHEMTREC**, in its years of operation, unfortunately has received many calls that were not pertinent to emergencies. These calls often interfere with the handling of legitimate emergencies. It is vital that callers understand **CHEMTREC** is neither intended nor equipped to function as a general information source.

Participating companies are requested to include the following on their shipping documents: **"For Chemical Emergency - Spill, Leak, Fire, Exposure, or Accident, call CHEMTREC 800-424-9300 day or night."**

An emergency reported to **CHEMTREC** is received by the Communicator on duty. Recording details in writing, or on a video-screen, and by tape recorder, they question the caller to determine as much essential information on the problem as possible. This enables them as a first step, to provide the best available information on the chemical(s) reported to be involved, giving specific indication of hazards, what to do, or what not to do in case of spills, fire or exposure.

Having advised the caller, the Communicator proceeds immediately to notify the shipper by phone or via electronic transmission. The known particulars of the emergency are relayed, and responsibility for further guidance - including dispatching personnel to the scene, or whatever seems warranted - passes to the shipper. **CHEMTREC** Communicators are under instructions to abide strictly by the information provided for their use by technical experts employed by the industry.

The second stage of assistance becomes more difficult where

the shipper is unknown. However, the Communicator has other resources. For example, on problems involving radioactive materials, **CHEMTREC** can call on the U.S. Department of Energy and State Radiological Emergency response plans for assistance.

**CHEMTREC** truly serves as the communication point for the entire emergency response system of the private sector and helps support that of the public sector. Many companies in chemical and other industries have their own well-organized national response systems. The chemical industry is constantly working to expand this capability and to assist others in planning theirs.

Identification of product and shipper is important to minimize time needed to provide necessary information and assistance. Shipping papers are carried in the engine or caboose of trains. Car numbers and carrier names can be useful in tracing unknown cargoes.

While **CHEMTREC** is in the private sector, its capabilities have been recognized for many years by the DOT, and a close and continuing relationship is maintained between **CHEMTREC** and the Department. More recently, formal acknowledgement of this arrangement was signed by DOT and CMA. Through the U.S. Coast Guard's National Response Center, the DOT is notified of significant incidents affecting personnel or the environment. Working closely together, the capabilities of each system will be enhanced.

**CHEMTREC** can usually provide hazard information warnings and guidance when given only the **NAME OF THE PRODUCT** and the **NATURE OF THE PROBLEM**. For more detailed information and/or assistance, or if product is unknown, attempt to provide as much of the following additional information as possible:



- Name of caller and call back number
- Location of problem
- Shipper or manufacturer
- Container type
- Rail car number
- Carrier name
- Consignee
- Local conditions

Limit calls to emergency situations only. Do NOT tie up the lines unnecessarily. The next call could be a true emergency.

**FOR CHEMICAL EMERGENCY**  
**Spill, Leak, Fire, Exposure, or Accident**  
**CALL CHEMTREC - DAY OR NIGHT**  
**1-800-424-9300**

**REPORTING OF INCIDENTS (49 CFR 171.15 and .16)**

At the earliest possible moment, each carrier who transports hazardous materials must give verbal notice after each incident that occurs during the course of transportation, loading, unloading, or temporary storage. An incident is any case, as a direct result of hazardous materials, where:

- a person is killed
- a person receives injuries requiring hospitalization
- estimated property damage exceeds \$50,000
- there is fire, spillage, breakage, or suspected contamination from radioactive material or etiologic agents
- there is an unintentional release of hazardous materials
- a situation exists that the carrier feels should be reported, e.g., a continuing danger to life exists at

the scene of the incident

Notice shall be given to the Department of Transportation by telephoning 1-800-424-8802 or 1-202-426-2675 and must include the following information:

- name of person making the report
- name and address of the carrier
- phone number of the person making the report
- date, time, and location of the incident
- the extent of injuries, if any
- classification, name, and quantity of hazardous material involved, if such information is available
- type of incident, nature of involvement, and whether a continuing danger to life exists at the scene

A written report must be submitted within 15 days after the incident. The report must be filed in duplicate using DOT Form F5800.1. The report must be sent to the Information Systems Manager, Materials Transportation Bureau, Department of Transportation, Washington, D.C. 20590. If the incident involves a hazardous waste a copy of the Hazardous Waste Manifest must be attached and an estimate of the quantity of material removed from the scene, the name and address of the facility where taken to, and the disposition of any waste not removed must be entered in Part H of the report form.

#### LOADING/UNLOADING PRECAUTIONS AND REQUIREMENTS (49 CFR 174.67)

Loading/unloading operations must be performed only by reliable persons properly instructed in procedures for hazardous materials. Brakes must be set and wheels blocked on all cars being loaded/unloaded. Caution signs must be so placed on the track or cars to give warning to persons approaching the cars and

must be left up until after operation are completed and the cars are disconnected. The signs must bear the words, "STOP - TANK CAR CONNECTED", or "STOP - MEN AT WORK". The letters must be white on a blue background.

Before a manhole cover or outlet valve cap is removed from a tank car, the car must be relieved of all interior pressure by cooling the tank with water or by venting the tank. However, if venting to relieve pressure will cause a dangerous amount of vapor to collect outside the car, venting and unloading must be deferred until the pressure is reduced by allowing the car to stand overnight or otherwise cooling the contents. These precautions are not necessary when the car is equipped with a manhole cover which hinges inward or with an inner manhole over which does not have to be removed to unload the car, and when pressure is relieved by piping vapor into a condenser or storage tank.

After the pressure is released, the seal must be broken and the manhole cover removed safely according to proper procedures for that car. Seals or other substances must not be thrown into the tank and the contents may not be spilled over the car or tank.

When the car is unloaded through a bottom outlet valve, the manhole cover must be adjusted safely according to proper procedures for that car. When unloading through the bottom outlet of a car equipped with an interior manhole type cover and in each case where unloading is done through the manhole, the manhole must be protected by asbestos or metal covers against the entrance of sparks or other sources of ignition of vapor, or by being covered and surrounded with wet burlap or similar cloth material. The burlap or other cloth must be kept damp by the replacement or the application of water as needed.

The valve cap, or the reducer when a large outlet is to be used, must be removed with a suitable wrench after the set screws are loosened and a pail must be placed in position to catch any liquid that may be in the outlet chamber. If the valve cap or reducer does not unscrew easily, it may be tapped lightly with a mallet or wooden block in an upward direction. If leakage shows upon starting the removal, the cap or reducer may not be entirely unscrewed. Sufficient threads must be left engaged and sufficient time allowed to permit controlled escape of any accumulation of liquid in the outlet chamber. If the leakage stops or the rate of leakage diminishes materially, the cap or reducer may be entirely removed. If the initial rate of leakage continues, further efforts must be made to seat the outlet valve. If this fails, the cap or reducer must be screwed up tight and the tank must be unloaded through the dome. If upon removal of the outlet cap the outlet chamber is found to be blocked with frozen liquid or any other matter, the cap must be replaced immediately and a careful examination must be made to determine whether the outlet casting has been cracked. If the obstruction is not frozen liquid, the car must be unloaded through the dome. If the obstruction is frozen liquid and no crack has been found in the outlet casting, the car may, if circumstances require it, be unloading from the bottom by removing the cap and attaching unloading connections immediately. Before opening the valve inside the tank car, steam must be applied to the outside of the outlet casting or wrap casting with burlap or other rags and hot water must be applied to melt the frozen liquid.

Loading/unloading connections must be securely attached to pipes on the dome or to the bottom discharge outlets before any operations commence. Tank cars may not be allowed to stand with loading/unloading connections attached after operations are completed. Throughout the entire period of operations and while

the car is connected, the car must be attended by the operator.

If necessary to discontinue operations for any reason, all connections must be disconnected. All valves must first be tightly closed, and the closures of all other openings securely applied. As soon as operations are completed, all valves must be made tight, the connections must be removed and all other closures made tight, except that heater coil inlet and outlet pipes must be left open for drainage. The manhole cover must be reapplied by the use of a bar or wrench, the outlet valve reducer and outlet valve cap replaced by the use of wrench having a handle at least 36 inches long, and the outlet valve cap plug, end plug, and all other closures of openings and of their protective housing must be closed by the use of a suitable tool.

Railroad defect cards may not be removed during operations. If oil or gasoline has been spilled on the ground around connections, it must be covered with fresh, dry sand or dirt. All tools and implements used in connection with unloading must be kept free of oil, dirt, and grit. When lading requiring placards is removed from tank cars, the placards must be removed, replaced, or reversed and the proper EMPTY placard applied.

#### DELIVERY AND STORAGE REQUIREMENTS (49 CFR 174.16 - 174.20)

A carrier must forward each shipment of hazardous materials promptly and within 48 hours (Saturdays, Sundays, and holidays excluded) after acceptance at the originating point or receipt at any yard, transfer station, or interchange point, except that where biweekly or weekly service only is performed, a shipment of hazardous materials must be forwarded on the first available train.

A tank car loaded with any flammable liquid or gas or a

poison gas may not be received and held at any point, subject to forwarding orders.

A shipment of explosives may not be unloaded at non-agency stations unless the consignee is there to receive it or unless properly locked and secure storage facilities are provided at that point for its protection. If delivery cannot be properly made, the shipment must be taken to next or nearest agency station for delivery.

A carrier shall require the consignee of each shipment of hazardous materials to remove the shipment from carrier's property within 48 hours (exclusive of Saturdays, Sundays, and holidays) after notice of arrival has been sent or given. If not so removed, the carrier shall immediately dispose of carload shipments by:

- storage on the carrier's property
- storage on other than the carrier's property, if safe storage on the carrier's property is not available
- sale at expiration of 15 calendar days after notice of arrival has been sent or given to the consignee, provided the consignor has been notified of the non-delivery at the expiration of a 48-hour period and orders for disposition have not been received.

An astray package of hazardous materials of known destination and in proper condition for safe transportation, must be forwarded immediately on an "astray bill", showing the information required on shipping papers.

When local conditions make the acceptance, transportation, or delivery of hazardous materials unusually hazardous, local restrictions may be imposed by the carrier. Each carrier must

report to the Bureau of Explosives for publication, the full information as to any restrictions which it imposes against the acceptance, delivery or transportation of hazardous materials, over any portion of its lines under this section.

RESTRICTION ON THE POSITION OF THE TANK CAR IN THE TRAIN (49 CFR 174.87 - 174.93)

A placarded tank car may not be transported in a passenger train. It may be transported in a mixed train when freight train service is not in operation provided the placarded car is not next to an occupied caboose or car carrying passengers. Except for a tank car placarded COMBUSTIBLE, a loaded placarded tank car in a moving or standing train may not be nearer than the sixth car from the engine, occupied caboose, or passenger car. When the train length will not permit this, it must be placed as near the middle of the train as possible and not nearer than the second car from the engine, caboose, or passenger car.

Except for tank cars placarded COMBUSTIBLE, no placarded tank car may be placed next to:

- any car placarded EXPLOSIVES A, RADIOACTIVE, or POISON GAS.
- an engine or occupied caboose
- a wooded underframe car
- a loaded flatcar (other than those equipped for TOFC/COFC service
- an open top car when any of the lading extends beyond the car ends or when any of the lading extending above the car is liable to shift and possibly extend beyond the ends of the car
- a car with automatic refrigeration or heating apparatus
- a car with open flame apparatus in service or an

- internal combustion engine in operation
- a car occupied by any person (including attendants for the placarded car)

In a moving or standing train, empty placarded tank cars (except those which last contained COMBUSTIBLE LIQUIDS) may not be placed nearer than the second car from the engine or occupied caboose. In a terminal, yard, or on a side track or siding, a car placarded EXPLOSIVES A must be separated from the engine by at least one non-placarded car.

#### SWITCHING REQUIREMENTS (49 CFR 174.83)

In switching operations where the use of a hand brake is necessary, a loaded placarded tank car may not be cut off until the preceeding car or cars clear the ladder track. In turn, the loaded placarded tank car must clear the ladder track before another car is allowed to follow. It must be determined by trial whether the hand brakes are in proper working condition before it is cut off.

A car placarded EXPLOSIVES A or POISON GAS may not be cut off while in motion or coupled into with more force than is necessary to complete the coupling. No car moving under its own momentum shall be allowed to strike any car placarded EXPLOSIVES A or POISON GAS.

#### EMPTY TANK CARS AND CLEANING REQUIREMENTS (49 CFR 172.510)

Placard empty tank cars with the appropriate EMPTY placard. Regulations do not require EMPTY placards for tank cars that:

- last contained a COMBUSTIBLE LIQUID



- have been reloaded with a non-hazardous material
- have been cleaned and made safe

In cleaning, all chemical residues have to be removed. Chemically reactive residue materials must not be mixed with the material to be loaded. Cleaning must be accomplished by approved methods.

#### SHIPPING PAPER REQUIREMENTS (49 CFR 172.200 - 172.205)

No person may accept for transportation by rail any hazardous material without properly prepared shipping papers. Shippers must prepare the shipping papers. Shipping papers may consist of a shipping order, bill of lading, manifest, or other shipping documents. All shipping papers for hazardous materials must contain the following information:

- the Proper Shipping Name of the material
- the Hazard Class of the material
- the UN/NA Identification Number of the material
- the total quantity of the material

The information above must be listed in this order from left to right on the shipping paper. Shippers may enter the technical and chemical group names in parenthesis after the proper shipping name. Hazardous substances must have the letters "RQ" entered either before or after the information above. The shipping paper must also contain the notation "PLACARDED \_\_\_\_\_." The blank will contain the name of the placard used. A shipping paper must also contain the shipper's certification. Hazardous Wastes also require a Hazardous Waste Manifest. Empty tank cars that previously contained a hazardous material (except a Combustible Liquid) that have not been reloaded or cleaned must also have shipping papers. The word "EMPTY:" must be inserted in

front of the information required above. A train crew member must have the shipping papers in their possession or they must be in the engine compartment.

#### INSPECTION REQUIREMENTS (49 CFR 174.8 - 174.10)

At any point where a train is required to be inspected, each loaded placarded rail car and each rail car immediately next to it must be inspected. The cars may continue in transit only when the inspection indicates that the cars are in a safe condition for transportation. Each loaded placard tank car must be inspected by the carrier before acceptance at the originating point and when received in interchange to see that it is not leaking and that the air and hand brakes, journal boxes, and trucks are in proper condition for service and to determine whether all required placards are in place and conform to the information given on the shipping paper.

An empty tank car which previously contained a hazardous material and which is tendered for movement or received in interchange must have all manhole covers, outlet valve cap plugs, end plugs, and plugs or caps or other openings securely in their proper places, except that heater coil inlet and outlet pipes must be left open for drainage.

The safety valves on a tank car may not be tested while the car is loaded. Whenever a test of the safety valves or tank becomes due while a loaded car is in transit, unless the car is leading or in a manifestly insecure condition, it must be forwarded to its destination, carded on each side with a card exhibiting the following notice:

Safety valves overdue for test:  
Tank overdue for test:  
Moving under authority of 49 CFR 174.9(c)

A prompt report of each such movement, showing the identifying initials and number of each car, must be made to the Bureau of Explosives by the carrier carding the cars.

When interchange occurs and the inspection is performed after daylight hours, electric flashlights should be used and naked lights may not be used.

A shipment of hazardous materials offered by a connecting carrier must comply with the revenue waybill, freight bill, manifest of loading, card waybill, switching order, transfer slip ticket, or other billing and must bear the placard notation and endorsement.

In the case of a tank car which has developed small leaks in the course of its movement to an interchange point and which requires a short movement to effect delivery for unloading by the consignee, the movement may be made if it can be made safely by adhering to the following precautions:

- a receptacle is attached under the leak to prevent the spread of the liquid
- protection is provided to prevent ignition of the material

#### MAJOR PROVISIONS AND REFERENCES FOR CANADIAN, INTERNATIONAL, AND SPECIAL SHIPMENTS (49 CFR 173.8)

Except for hazardous wastes, shipments of hazardous materials which conform to the regulations of the Canadian Transport Commission (CTC) may be transported from the point of entry in the United States to their destination in the United States or through the United States to a destination in Canada. Empty tank cars may be transported in conformity with CTC

regulations from point of origin in the United States to point of entry in Canada. Tank cars constructed and maintained in full compliance with the corresponding specifications prescribed by the Railway Transport Committee of the CTC in its regulations for the transportation of Dangerous Commodities by Rail may be used for the shipment of hazardous materials in the United States.

#### ORGANIZATIONS TO CONTACT FOR INFORMATION REGARDING ANY HAZARDOUS MATERIAL

The Association of American Railroads' (AAR) Bureau of Explosives at 1-202-835-9500 or the AAR Mechanical Division at 1-202-835-9271.

ET. AL.

#### EXPLANATION OF INFORMATION CONTAINED IN THE HAZARD CLASS SECTIONS OF THIS GUIDEBOOK

The Hazard Class sections of this guidebook are all organized in the same manner. The information contained in each section will be unique to that hazard class. The information to be found in these sections consists of:

- Loading/unloading precautions and requirements
- Delivery and storage requirements
- Restrictions on the position of the car in the train
- Switching requirements
- Empty tank cars and cleaning requirements
- Inspection requirements
- Organizations to contact for information about that hazard class
- Explanation of the information contained in the commodity information sections of the guidebook

# UN/NA NUMBER NUMERICAL LISTING OF HAZARDOUS MATERIALS

UN/NA NO.	PROPER SHIPPING NAME	HAZMAT GUIDE	
		CLASS	PAGE
UN 1005	AMMONIA, ANHYDROUS	NFG	x/y
UN 1010	BUTADIENE, INHIBITED	FG	x/y
UN 1017	CHLORINE	NFG	x/y
UN 1018	CHLORODIFLUOROMETHANE	NFG	x/y
UN 1028	DICHLORODIFLUOROMETHANE	NFG	x/y
UN 1032	DIMETHYLAMINE, ANHYDROUS	FG	x/y
UN 1037	ETHYL CHLORIDE	FL	x/y
UN 1040	ETHYLENE OXIDE	FL	D47/50
UN 1050	HYDROGEN CHLORIDE	NFG	x/y
NA 1051	HYDROCYANIC ACID, LIQUIFIED	PA	x/y
UN 1052	HYDROGEN FLUORIDE	CM	x/y
UN 1063	METHYL CHLORIDE	FG	x/y
UN 1075	LIQUEFIED PETROLEUM GAS	FG	x/y
UN 1079	SULFUR DIOXIDE	NFG	x/y
UN 1086	VINYL CHLORIDE	FG	x/y
UN 1089	ACETALDEHYDE	FL	x/y
UN 1090	ACETONE	CM	x/y
UN 1093	ACRYLONITRILE	FL	x/y
UN 1114	BENZENE	FL	x/y
NA 1120	BUTYL ALCOHOL	FL	x/y
UN 1123	BUTYL ACETATE	FL	x/y
UN 1129	BUTYRALDEHYDE	FL	x/y
UN 1131	CARBON BISULFIDE	FL	x/y
UN 1134	CHLOROBENZENE	FL	x/y
UN 1145	CYCLOHEXANE	FL	x/y
UN 1170	ALCOHOLIC BEVERAGE, NOS	CL/FL	x/y
UN 1173	ETHYL ACETATE	FL	x/y
UN 1175	ETHYL BENZENE	FL	x/y
UN 1193	METHYL ETHYL KETONE	FL	x/y

UN/NA NO.	PROPER SHIPPING NAME	HAZMAT GUIDE CLASS	PAGE
UN 1198	FORMALDEHYDE SOLUTION (FLASH POINT LESS THAN 141°F; OVER 110 GALS)	CL	x/y
UN 1198	FORMALDEHYDE SOLUTION (FLASH POINT LESS THAN 141°F; 110 GALS OR LESS)	ORM-A	x/y
UN 1203	GASOLINE	FL	x/y
UN 1208	HEXANE	FL	x/y
UN 1219	ISOPROPANOL	FL	x/y
UN 1230	METHYL ALCOHOL	FL	x/y
UN 1247	METHYL METHACRYLATE MONOMER, INHIBITED	FL	x/y
UN 1255	PETROLEUM NAPHTHA	CL/FL	x/y
UN 1267	CRUDE OIL, PETROLEUM	CL/FL	x/y
UN 1268	PETROLEUM DISTILLATE	CL/FL	x/y
NA 1270	OIL, NOS	CL/FL	x/y
UN 1274	PROPYL ALCOHOL	FL	x/y
UN 1280	PROPYLENE OXIDE	FL	x/y
UN 1294	TOLUENE	FL	x/y
UN 1301	VINYL ACETATE	FL	x/y
UN 1303	VINYLDENE CHLORIDE, INHIBITED	FL	x/y
UN 1307	XYLENE	FL	x/y
UN 1381	PHOSPHORUS, WHITE OR YELLOW, DRY	FS	x/y
UN 1381	PHOSPHORUS, WHITE OR YELLOW, IN WATER	FS	x/y
UN 1428	SODIUM, METAL OR METALLIC	FS	x/y
UN 1547	ANILINE OIL, LIQUID	PB	x/y
UN 1600	DINITROTOLUENE, LIQUID	ORM-E	x/y
UN 1649	MOTOR FUEL ANTIKNOCK COMPOUND	PB	x/y
UN 1649	ANTIKNOCK COMPOUND	PB	x/y
UN 1671	PHENOL	PB	x/y
UN 1715	ACETIC ANHYDRIDE	CM	x/y
NA 1719	ALKALINE LIQUID, NOS	CM	x/y
NA 1760	ALUMINUM SULFATE SOLUTION	ORM-B	x/y
NA 1760	COMPOUND, TREE/WEED KILLING, LIQUID	CM	x/y

UN/NA NO.	PROPER SHIPPING NAME	HAZMAT GUIDE	
		CLASS	PAGE
UN 1760	CORROSIVE LIQUID, NOS	CM	x/y
NA 1778	HYDROFLUOROSILICIC ACID	CM	x/y
UN 1783	HEXAMETHYLENE DIAMINE SOLUTION	CM	x/y
UN 1789	HYDROCHLORIC ACID	CM	x/y
UN 1805	PHOSPHORIC ACID	CM	x/y
UN 1814	POTASSIUM HYDROXIDE, LIQUID	CM	x/y
UN 1814	POTASSIUM HYDROXIDE, SOLUTION	CM	x/y
UN 1823	SODIUM HYDROXIDE, BEAD	CM	x/y
UN 1823	SODIUM HYDROXIDE, DRY SOLID	CM	x/y
UN 1823	SODIUM HYDROXIDE, FLAKE	CM	x/y
UN 1823	SODIUM HYDROXIDE, GRANULAR	CM	x/y
UN 1824	SODIUM HYDROXIDE, LIQUID	CM	x/y
UN 1824	SODIUM HYDROXIDE, SOLUTION	CM	x/y
UN 1830	SULFURIC ACID	CM	x/y
NA 1831	OLEUM	CM	x/y
NA 1832	FUMING SULFURIC ACID	CM	x/y
UN 1832	SULFURIC ACID, SPENT	CM	x/y
UN 1846	CARBON TETRACHLORIDE	ORM-A	x/y
UN 1863	FUEL, AVIATION, TURBINE ENGINE	CL/FL	x/y
UN 1866	RESIN SOLUTION	FL	x/y
UN 1888	CHLOROFORM	ORM-A	x/y
UN 1917	ETHYL ACRYLATE, INHIBITED	FL	x/y
NA 1986	DENATURED ALCOHOL	FL	x/y
UN 1987	ALCOHOL, NOS	CL/FL	x/y
UN 1991	CHLOROPRENE, INHIBITED	FL	x/y
NA 1993	COMBUSTIBLE LIQUID, NOS	CL	x/y
NA 1993	COMPOUND, TREE/WEED KILLING, LIQUID	CL	x/y
NA 1993	CREOSOTE, COAL TAR	CL	x/y
UN 1993	FLAMMABLE LIQUID, NOS	FL	x/y
NA 1993	FUEL OIL	CL	x/y
NA 1993	SOLVENT, NOS	CL/FL	x/y

UN/NA NO.	PROPER SHIPPING NAME	HAZMAT GUIDE CLASS	PAGE
UN 1999	TAR, LIQUID	CL/FL	x/y
NA 1999	ASPHALT, CUT BACK	CL/FL	x/y
UN 2014	HYDROGEN PEROXIDE SOLUTION (8%-40% PEROXIDE)	OXID	x/y
UN 2014	HYDROGEN PEROXIDE SOLUTION (40%-52% PEROXIDE)	OXID	x/y
UN 2015	HYDROGEN PEROXIDE SOLUTION (OVER 52% PEROXIDE)	OXID	x/y
UN 2055	STYRENE MONOMER, INHIBITED	FL	x/y
UN 2067	AMMONIUM NITRATE FERTILIZER	OXID	x/y
UN 2078	TOLUENE DIISOCYANATE	PB	x/y
UN 2187	CARBON DIOXIDE, LIQUIFIED	NFG	x/y
UN 2209	FORMALDEHYDE SOLUTION (FLASH POINT GREATER THAN 141°F; 110 GALS OR LESS)	ORM-A	x/y
UN 2209	FORMALDEHYDE SOLUTION (FLASH POINT GREATER THAN 141°F; OVER 110 GALS)	CL	x/y
UN 2215	MALEIC ANHYDRIDE	ORM-A	x/y
UN 2218	ACRYLIC ACID	CM	x/y
UN 2582	FERRIC CHLORIDE SOLUTION	CM	x/y
UN 2789	ACETIC ACID, GLACIAL	CM	x/y
NA 2810	COMPOUND, TREE/WEED KILLING, LIQUID	PB	x/y
NA 2821	PHENOL, LIQUID	PB	x/y
NA 2821	PHENOL, SOLUTION	PB	x/y
UN 2868	RESIN SOLUTION	FL	x/y
NA 2922	SODIUM HYDROSULFIDE, SOLUTION	CM	x/y
NA 9077	ADIPIIC ACID	ORM-E	x/y
NA 9188	HAZARDOUS SUBSTANCE, LIQUID, NOS	ORM-E	x/y
NA 9188	HAZARDOUS SUBSTANCE, SOLID, NOS	ORM-E	x/y



# ALPHABETICAL LISTING OF HAZARDOUS MATERIALS

PROPER SHIPPING NAME AND OTHER NAMES	UN/NA NO.	HAZMAT CLASS	GUIDE PAGE
ACETALDEHYDE	UN 1089	FL	x/y
ACETIC ACID, GLACIAL	UN 2789	CM	x/y
ACETIC ANHYDRIDE	UN 1715	CM	x/y
ACETONE	UN 1090	CM	x/y
ACETYL ACETONE PEROXIDE (OVER 9% ACTIVE OXYGEN)	NONE - FORBIDDEN TO SHIP		
ACETYL BENZOYL PEROXIDE, SOLID, OR OVER 40% IN SOLUTION	NONE - FORBIDDEN TO SHIP		
ACETYL BENZOYL PEROXIDE SOLUTION (OVER 40%)	NONE - FORBIDDEN TO SHIP		
ACETYL PEROXIDE SOLUTION (OVER 25%)	NONE - FORBIDDEN TO SHIP		
ACETYL CYCLOHEXANESULFONYL PEROXIDE (OVER 82%, LESS THAN 12% WATER)	NONE - FORBIDDEN TO SHIP		
ACETYL PEROXIDE, SOLID, OR OVER 25% IN SOLUTION	NONE - FORBIDDEN TO SHIP		
ACETYLENE, LIQUID	NONE - FORBIDDEN TO SHIP		
ACETYLENE SILVER NITRATE	NONE - FORBIDDEN TO SHIP		
ACQUINITE	UN 1063	FG	x/y
ACRYLIC ACID	UN 2218	CM	x/y
ACRYLONITRILE	UN 1093	FL	x/y
ADIPIC ACID	NA 9077	ORM-E	x/y
ALCOHOL	UN 1987	CL/FL	x/y
ALCOHOL, NOS	UN 1987	CL/FL	x/y
ALCOHOLIC BEVERAGE, NOS	UN 1170	CL/FL	x/y
ALKALINE LIQUID, NOS	NA 1719	CM	x/y
ALLENE	UN 1075	FG	x/y
ALUMINUM DROSS, WET OR HOT	NONE - FORBIDDEN TO SHIP		
ALUMINUM SULFATE SOLUTION	NA 1760	ORM-B	x/y
AM-FOL	UN 1005	NFG	x/y

PROPER SHIPPING NAME AND OTHER NAMES	UN/NA NO.	HAZMAT CLASS	GUIDE PAGE
AMMONIA	UN 1005	NFG	x/y
AMMONIA GAS	UN 1005	NFG	x/y
AMMONIA, ANHYDROUS	UN 1005	NFG	x/y
AMMONIA, LIQUID	UN 1005	NFG	x/y
AMMONIA, LIQUIFIED	UN 1005	NFG	x/y
AMMONIUM AZIDE	NONE - FORBIDDEN TO SHIP		
AMMONIUM BROMATE	NONE - FORBIDDEN TO SHIP		
AMMONIUM CHLORATE	NONE - FORBIDDEN TO SHIP		
AMMONIUM FULMINATE	NONE - FORBIDDEN TO SHIP		
AMMONIUM NITRATE	NONE - FORBIDDEN TO SHIP		
AMMONIUM NITRATE	UN 2067	OXID	x/y
AMMONIUM NITRATE FERTILIZER	UN 2067	OXID	x/y
ANHYDROUS AMMONIA	UN 1005	NFG	x/y
ANHYDROUS DIMETHYLAMINE	UN 1032	FG	x/y
ANHYDROUS HYDROGEN CHLORIDE	UN 1050	NFG	x/y
ANILINE OIL, LIQUID	UN 1547	PB	x/y
ANTIKNOCK AGENT	UN 1649	PB	x/y
ANTIKNOCK COMPOUND	UN 1649	PB	x/y
ANTIMONY SULFIDE AND A CHLORATE, MIXTURES OF	NONE - FORBIDDEN TO SHIP		
ARSENIC SULFIDE AND A CHLORATE, MIXTURES OF	NONE - FORBIDDEN TO SHIP		
ASCARIDOLE (ORGANIC PEROXIDE)	NONE - FORBIDDEN TO SHIP		
ASPHALT, CUT BACK	NA 1999	CL/FL	x/y
AVIATION FUEL, TURBINE ENGINE	UN 1863	CL/FL	x/y
AZAUROLIC ACID, SALT OF, DRY	NONE - FORBIDDEN TO SHIP		
3-AZIDO-1,2-PROPYLENE GLYCOL DINITRATE	NONE - FORBIDDEN TO SHIP		
5-AZIDO-1-HYDROXY TETRAZOLE	NONE - FORBIDDEN TO SHIP		
AZIDODITHIOCARBONIC ACID	NONE - FORBIDDEN TO SHIP		
AZIDOETHYL NITRATE	NONE - FORBIDDEN TO SHIP		
AZIDO GUANIDINE PICRATE, DRY	NONE - FORBIDDEN TO SHIP		

PROPER SHIPPING NAME AND OTHER NAMES	UN/NA NO.	HAZMAT CLASS	GUIDE PAGE
AZIDO HYDROXY TETRAZOLE (MERCURY AND SILVER SALTS)	NONE	- FORBIDDEN TO SHIP	
AZOTETRAZOLE, DRY	NONE	- FORBIDDEN TO SHIP	
BENZENE	UN 1114	FL	x/y
BENZENE DIAZONIUM CHLORIDE, DRY	NONE	- FORBIDDEN TO SHIP	
BENZENE DIAZONIUM NITRATE, DRY	NONE	- FORBIDDEN TO SHIP	
BENZENE TRIOZONIDE	NONE	- FORBIDDEN TO SHIP	
BENZOL	UN 1114	FL	x/y
BENZOXIDIAZOLES, DRY	NONE	- FORBIDDEN TO SHIP	
BENZOYL AZIDE	NONE	- FORBIDDEN TO SHIP	
BIPHENYL TRIOZONIDE	NONE	- FORBIDDEN TO SHIP	
BROMINE AZIDE	NONE	- FORBIDDEN TO SHIP	
4-BROMO-1,2-DINITROBENZENE	NONE	- FORBIDDEN TO SHIP	
1-BROMO-2-NITROBENZENE	NONE	- FORBIDDEN TO SHIP	
BROMOSILANE	NONE	- FORBIDDEN TO SHIP	
BUTADIENE	UN 1010	FG	x/y
BUTADIENE, INHIBITED	UN 1010	FG	x/y
BUTANE	UN 1075	FG	x/y
1,2,4-BUTANETRIOL TRINITRATE	NONE	- FORBIDDEN TO SHIP	
tert-BUTOXYCARBONYL AZIDE	NONE	- FORBIDDEN TO SHIP	
BUTYL ACETATE	UN 1123	FL	x/y
BUTYL ACRYLATE	NA 1993	CL	x/y
BUTYL ALCOHOL	NA 1120	FL	x/y
tert-BUTYL HYDROPEROXIDE, (OVER 90% WITH WATER)	NONE	- FORBIDDEN TO SHIP	
tert-BUTYL PEROXYACETATE, (OVER 76% IN SOLUTION)	NONE	- FORBIDDEN TO SHIP	
n-BUTYL PEROXYDICARBONATE, (OVER 52% IN SOLUTION)	NONE	- FORBIDDEN TO SHIP	
tert-BUTYL PEROXYISOBUTYRATE, (OVER 77% IN SOLUTION)	NONE	- FORBIDDEN TO SHIP	

PROPER SHIPPING NAME AND OTHER NAMES	UN/NA NO.	HAZMAT CLASS	GUIDE PAGE
BUTYRALDEHYDE	UN 1129	FL	x/y
CARBAZIDE	NONE - FORBIDDEN TO SHIP		
CARBOLIC ACID	UN 1671	PB	x/y
CARBOLIC ACID, LIQUID	NA 2821	PB	x/y
CARBON BISULFIDE	UN 1131	FL	x/y
CARBON DIOXIDE, LIQUID	UN 2187	NFG	x/y
CARBON DIOXIDE, LIQUIFIED	UN 2187	NFG	x/y
CARBON TETRACHLORIDE	UN 1846	ORM-A	x/y
CHARCOAL SCREENINGS, WET	NONE - FORBIDDEN TO SHIP		
CHARCOAL, WET	NONE - FORBIDDEN TO SHIP		
CHLORINE	UN 1017	NFG	x/y
CHLORINE AZIDE	NONE - FORBIDDEN TO SHIP		
CHLORINE DIOXIDE (NOT HYDRATE)	NONE - FORBIDDEN TO SHIP		
CHLOROBENZENE	UN 1134	FL	x/y
CHLOROBENZOL	UN 1134	FL	x/y
CHLORODIFLUOROMETHANE	UN 1018	NFG	x/y
CHLOROETHENE	UN 1086	FG	x/y
CHLOROETHYLENE	UN 1086	FG	x/y
CHLOROFORM	UN 1888	ORM-A	x/y
CHLOROMETHANE	UN 1063	FG	x/y
CHLOROPICRIN	UN 1063	FG	x/y
CHLOROPRENE	UN 1991	FL	x/y
CHLOROPRENE, INHIBITED	UN 1991	FL	x/y
CHLOROPRENE, UNINHIBITED	NONE - FORBIDDEN TO SHIP		
CHRYSAMMININ ACID	NONE - FORBIDDEN TO SHIP		
COAL BRIQUETTES, HOT	NONE - FORBIDDEN TO SHIP		
COAL TAR CREOSOTE	NA 1993	CL	x/y
COKE, HOT	NONE - FORBIDDEN TO SHIP		
COMBUSTIBLE LIQUID, NOS	NA 1993	CL	x/y
COMMERCIAL SHAPED CHARGES CONTAINING OVER 8 OZS. OF EXPLOSIVES	NONE - FORBIDDEN TO SHIP		

PROPER SHIPPING NAME AND OTHER NAMES	UN/NA NO.	HAZMAT CLASS	GUIDE PAGE
COMPOUND, TREE/WEED KILLING, LIQUID	NA 1993	CL	x/y
COMPOUND, TREE/WEED KILLING, LIQUID	NA 1760	CM	x/y
COMPOUND, TREE/WEED KILLING, LIQUID	NA 1993	FL	x/y
COMPOUND, TREE/WEED KILLING, LIQUID	NA 2810	PB	x/y
CONTAMINATED METHANOL	UN 1230	FL	x/y
COPPER ACETYLIDE	NONE - FORBIDDEN TO SHIP		
COPPER AMINE AZIDE	NONE - FORBIDDEN TO SHIP		
COPPER TETRAMINE NITRATE	NONE - FORBIDDEN TO SHIP		
CORROSIVE LIQUID, NOS	UN 1760	CM	x/y
CREOSOTE	NA 1993	CL	x/y
CREOSOTE, COAL TAR	NA 1993	CL	x/y
CRUDE OIL, PETROLEUM	UN 1267	CL/FL	x/y
CRUDE PETROLEUM OIL	UN 1267	CL/FL	x/y
CUT BACK ASPHALT	NA 1999	CL/FL	x/y
CYANURIC TRIAZIDE	NONE - FORBIDDEN TO SHIP		
CYCLOHEXANE	UN 1145	FL	x/y
CYCLOTETRAMETHYLENE TETRANITRAMINE, DRY	NONE - FORBIDDEN TO SHIP		
DENATURED ALCOHOL	NA 1986	FL	x/y
DI-(1-HYDROXYTETRAZOLE), DRY	NONE - FORBIDDEN TO SHIP		
DI-(1-NAPHTHOYL)PEROXIDE	NONE - FORBIDDEN TO SHIP		
2,2-DI-(4,4-DI-TERT-BUTYLPEROXY- CYCLOHEXYL)	NONE - FORBIDDEN TO SHIP		
DIACETONE ALCOHOL PEROXIDES	NONE - FORBIDDEN TO SHIP		
p-DIAZIDOBENZENE	NONE - FORBIDDEN TO SHIP		
1,2-DIAZIDOETHANE	NONE - FORBIDDEN TO SHIP		
1,1'-DIAZOAMINONAPHTHALENE	NONE - FORBIDDEN TO SHIP		
DIAZOAMINOTETRAZOLE, DRY	NONE - FORBIDDEN TO SHIP		
DIAZODINITROPHENOL, DRY	NONE - FORBIDDEN TO SHIP		
DIAZODIPHENYLMETHANE	NONE - FORBIDDEN TO SHIP		
DIAZONIUM NITRATES, DRY	NONE - FORBIDDEN TO SHIP		

PROPER SHIPPING NAME AND OTHER NAMES	UN/NA NO.	HAZMAT CLASS	GUIDE PAGE
DIAZONIUM PERCHLORATES, DRY	NONE	- FORBIDDEN TO SHIP	
1,3-DIAZOPROPANE	NONE	- FORBIDDEN TO SHIP	
DIBENZYL PEROXYDICARBONATE, (OVER 87% WITH WATER)	NONE	- FORBIDDEN TO SHIP	
DI-(BETA-NITROXYETHYL)AMMONIUM NITRATE	NONE	- FORBIDDEN TO SHIP	
DIBROMOACETYLENE	NONE	- FORBIDDEN TO SHIP	
N,N'-DICHLORAZODICARBONAMIDINE, DRY SALTS OF	NONE	- FORBIDDEN TO SHIP	
DICHLOROACETYLENE	NONE	- FORBIDDEN TO SHIP	
2,4-DICHLOROBENZOYL PEROXIDE, (OVER 75% WITH WATER)	NONE	- FORBIDDEN TO SHIP	
DICHLORODIFLUOROMETHANE	UN 1028	NFG	x/y
DIESEL FUEL	NA 1993	CL	x/y
DIESEL OIL	NA 1993	CL	x/y
DIETHANOL NITROSAMINE DINITRATE, DRY	NONE	- FORBIDDEN TO SHIP	
DIETHYLENE GLYCOL DINITRATE	NONE	- FORBIDDEN TO SHIP	
DIETHYLGOLD BROMIDE	NONE	- FORBIDDEN TO SHIP	
DIETHYL PEROXYCARBONATE, (OVER 27% IN SOLUTION)	NONE	- FORBIDDEN TO SHIP	
DIFLUOROMONOCHELOETHANE	UN 1028	NFG	x/y
1,8-DIHYDROXY-2,4,5,7-TETRANITRO ANTHRAQUINONE (CHRYSAMMININ ACID)	NONE	- FORBIDDEN TO SHIP	
DIIDOACETYLENE	NONE	- FORBIDDEN TO SHIP	
DIISOPROPYLBENZENE HYDROPEROXIDE, (OVER 72% IN SOLUTION)	NONE	- FORBIDDEN TO SHIP	
DIMETHYL AMINE	UN 1032	FG	x/y
2,5-DIMETHYL-2,5-DIHYDROPEROXY HEXANE (OVER 82% WITH WATER)	NONE	- FORBIDDEN TO SHIP	
DIMETHYLAMINE	UN 1032	FG	x/y
DIMETHYLAMINE, ANHYDROUS	UN 1032	FG	x/y
DIMETHYLENEMETHANE	UN 1075	FG	x/y

PROPER SHIPPING NAME AND OTHER NAMES	UN/NA NO.	HAZMAT CLASS	GUIDE PAGE
DIMETHYLHEXANE DIHYDROPEROXIDE, DRY	NONE	- FORBIDDEN TO SHIP	
1,4-DINITRO-1,1,4,4-TETRAMETHYLOLBU- TANETETRANITRATE, DRY	NONE	- FORBIDDEN TO SHIP	
2,4-DINITRO-1,3,5-TRIMETHYLBENZENE	NONE	- FORBIDDEN TO SHIP	
1,3-DINITRO-4,5-DINITROSOBENZENE	NONE	- FORBIDDEN TO SHIP	
1,3-DINITRO-5,5-DIMETHYL HYDANTOIN	NONE	- FORBIDDEN TO SHIP	
DINITRO-7,8-DIMETHYLGLYCOLURIL, DRY	NONE	- FORBIDDEN TO SHIP	
1,2-DINITROETHANE	NONE	- FORBIDDEN TO SHIP	
1,1-DINITROETHANE, DRY	NONE	- FORBIDDEN TO SHIP	
DINITROGLYCOLURIL	NONE	- FORBIDDEN TO SHIP	
DINITROMETHANE	NONE	- FORBIDDEN TO SHIP	
DINITROPROPYLENE GLYCOL	NONE	- FORBIDDEN TO SHIP	
2,4-DINITRORESORCINOL, DRY HEAVY METAL SALTS OF	NONE	- FORBIDDEN TO SHIP	
4,6-DINITRORESORCINOL, DRY HEAVY METAL SALTS OF	NONE	- FORBIDDEN TO SHIP	
3,5-DINITROSALICYLIC ACID (LEAD SALT), DRY	NONE	- FORBIDDEN TO SHIP	
2,2-DINITROSTILBENE	NONE	- FORBIDDEN TO SHIP	
DINITROTOLUENE, LIQUID	UN 1600	ORM-E	x/y
a,a'-DI-(NITROXY)METHYLETHER	NONE	- FORBIDDEN TO SHIP	
1,9-DINITROXY PENTAMETHYLENE-2,4,6,8- TETRAMINE, DRY	NONE	- FORBIDDEN TO SHIP	
2,2-DI-(TERT-BUTYLPEROXY) BUTANE, (OVER 55% IN SOLUTION)	NONE	- FORBIDDEN TO SHIP	
DI-(TERT-BUTYLPEROXY) PHTHALATE, (OVER 55% IN SOLUTION)	NONE	- FORBIDDEN TO SHIP	
DIVINYL	UN 1010	FG	x/y
DIVINYL B	UN 1010	FG	x/y
DMA	UN 1032	FG	x/y
DRY AZIDO GUANIDINE PICRATE	NONE	- FORBIDDEN TO SHIP	

PROPER SHIPPING NAME AND OTHER NAMES	UN/NA NO.	HAZMAT CLASS	GUIDE PAGE
DRY AZOTETRAZOLE	NONE - FORBIDDEN TO SHIP		
DRY BENZENE DIAZONIUM CHLORIDE	NONE - FORBIDDEN TO SHIP		
DRY BENZENE DIAZONIUM NITRATE	NONE - FORBIDDEN TO SHIP		
DRY BENZOXIDIAZOLES	NONE - FORBIDDEN TO SHIP		
DRY CYCLOTETRAMETHYLENE TETRANITRAMINE	NONE - FORBIDDEN TO SHIP		
DRY DI-(1-HYDROXYTETRAZOLE)	NONE - FORBIDDEN TO SHIP		
DRY DIAZOAMINOTETRAZOLE	NONE - FORBIDDEN TO SHIP		
DRY DIAZODINITROPHENOL	NONE - FORBIDDEN TO SHIP		
DRY DIAZONIUM NITRATES	NONE - FORBIDDEN TO SHIP		
DRY DIAZONIUM PERCHLORATES	NONE - FORBIDDEN TO SHIP		
DRY DIETHANOL NITROSAMINE DINITRATE	NONE - FORBIDDEN TO SHIP		
DRY DIMETHYLHEXANE DIHYDROPEROXIDE	NONE - FORBIDDEN TO SHIP		
DRY 1,4-DINITRO-1,1,4,4-TETRAMETHYL- OLBUTANETETRANITRATE	NONE - FORBIDDEN TO SHIP		
DRY DINITRO-7,8-DIMETHYLGlyCOLURIL	NONE - FORBIDDEN TO SHIP		
DRY 1,1-DINITROETHANE	NONE - FORBIDDEN TO SHIP		
DRY 3,5-DINITROSALICYLIC ACID	NONE - FORBIDDEN TO SHIP		
DRY 3,5-DINITROSALICYLIC ACID (LEAD SALT)	NONE - FORBIDDEN TO SHIP		
DRY 1,9-DINITROXY PENTAMETHYLENE- 2,4,6,8-TETRAMINE	NONE - FORBIDDEN TO SHIP		
DRY FULMINATE OF MERCURY	NONE - FORBIDDEN TO SHIP		
DRY GUANYL NITROSAMINO GUANYLIDENE HYDRAZINE	NONE - FORBIDDEN TO SHIP		
DRY HEAVY METAL SALTS OF 2,4- DINITRORESORCINOL	NONE - FORBIDDEN TO SHIP		
DRY HEAVY METAL SALTS OF 4,6- DINITRORESORCINOL	NONE - FORBIDDEN TO SHIP		
DRY HEXAMETHYLENE TRIPEROXIDE DIAMINE	NONE - FORBIDDEN TO SHIP		



PROPER SHIPPING NAME AND OTHER NAMES	UN/NA NO.	HAZMAT CLASS	GUIDE PAGE
DRY 2,2',4,4',6,6'-HEXANITRO-3,3'- DIHYDROXYAZOBENZENE	NONE	-	FORBIDDEN TO SHIP
DRY N,N'-(HEXANITRODIPHENYL)ETHYLENE DINITRAMINE	NONE	-	FORBIDDEN TO SHIP
DRY INITIATING EXPLOSIVES	NONE	-	FORBIDDEN TO SHIP
DRY INOSITOL HEXANITRATE	NONE	-	FORBIDDEN TO SHIP
DRY INULIN TRINITRATE	NONE	-	FORBIDDEN TO SHIP
DRY IODINE AZIDE	NONE	-	FORBIDDEN TO SHIP
DRY IODOXY COMPOUNDS	NONE	-	FORBIDDEN TO SHIP
DRY LEAD AZIDE	NONE	-	FORBIDDEN TO SHIP
DRY LEAD MONONITRORESORCINATE	NONE	-	FORBIDDEN TO SHIP
DRY LEAD PICRATE	NONE	-	FORBIDDEN TO SHIP
DRY LEAD SALT	NONE	-	FORBIDDEN TO SHIP
DRY LEAD STYPHNATE	NONE	-	FORBIDDEN TO SHIP
DRY METAL SALTS OF METHYL NITRAMINE	NONE	-	FORBIDDEN TO SHIP
DRY 6-NITRO-4-DIAZOTOLUENE-3- SULFONIC ACID	NONE	-	FORBIDDEN TO SHIP
DRY NITROMANNITE	NONE	-	FORBIDDEN TO SHIP
DRY NITROSUGARS	NONE	-	FORBIDDEN TO SHIP
DRY PENTAERYTHRITE TETRANITRATE	NONE	-	FORBIDDEN TO SHIP
DRY PENTANITROANILINE	NONE	-	FORBIDDEN TO SHIP
DRY m-PHENYLENE DIAMINEDIPERCHLORATE	NONE	-	FORBIDDEN TO SHIP
DRY SALT OF AZAUROLIC ACID	NONE	-	FORBIDDEN TO SHIP
DRY SALTS OF N,N'- DICHLORAZODICARBONAMIDINE	NONE	-	FORBIDDEN TO SHIP
DRY SALTS OF METHYLAMINE DINITRAMINE	NONE	-	FORBIDDEN TO SHIP
DRY SILVER ACETYLIDE	NONE	-	FORBIDDEN TO SHIP
DRY SILVER AZIDE	NONE	-	FORBIDDEN TO SHIP
DRY SILVER CHLORITE	NONE	-	FORBIDDEN TO SHIP
DRY SILVER FULMINATE	NONE	-	FORBIDDEN TO SHIP
DRY SILVER OXALATE	NONE	-	FORBIDDEN TO SHIP

PROPER SHIPPING NAME AND OTHER NAMES	UN/NA NO.	HAZMAT CLASS	GUIDE PAGE
DRY SILVER PICRATE	NONE	- FORBIDDEN TO SHIP	
DRY SUCROSE OCTANITRATE	NONE	- FORBIDDEN TO SHIP	
DRY TETRAETHYLAMMONIUM PERCHLORATE	NONE	- FORBIDDEN TO SHIP	
DRY TETRANITRORESORCINOL	NONE	- FORBIDDEN TO SHIP	
DRY TETRAZINE	NONE	- FORBIDDEN TO SHIP	
DRY TETRAZOLYL AZIDE	NONE	- FORBIDDEN TO SHIP	
DRY 2,4,6-TRINITRO-1,3,5-TRIAZIDO BENZENE	NONE	- FORBIDDEN TO SHIP	
DRY 2,4,6-TRINITROPHENYL GUANIDINE	NONE	- FORBIDDEN TO SHIP	
DRY 2,4,6-TRINITROPHENYL TRIMETHYLOL METHYL NITRAMINE TRINITRATE	NONE	- FORBIDDEN TO SHIP	
EPOXYETHANE	UN 1040	FL	D47/50
ERYTHENE	UN 1010	FG	x/y
ETHANOIC ACID	UN 2789	CM	x/y
ETHANOL AMINE DINITRATE	NONE	- FORBIDDEN TO SHIP	
ETHYL ACETATE	UN 1173	FL	x/y
ETHYL ACRYLATE, INHIBITED	UN 1917	FL	x/y
ETHYL ALDEHYDE	UN 1089	FL	x/y
ETHYL BENZENE	UN 1175	FL	x/y
ETHYL CHLORIDE	UN 1037	FL	x/y
ETHYL HYDROPEROXIDE	NONE	- FORBIDDEN TO SHIP	
ETHYL PERCHLORATE	NONE	- FORBIDDEN TO SHIP	
ETHYLENE DIAMINE DIPERCHLORATE	NONE	- FORBIDDEN TO SHIP	
ETHYLENE GLYCOL DINITRATE	NONE	- FORBIDDEN TO SHIP	
ETHYLENE OXIDE	UN 1040	FL	D47/50
ETHYLENEOXIDE	UN 1040	FL	D47/50
EXPLOSIVE, FORBIDDEN	NONE	- FORBIDDEN TO SHIP	
FERRIC CHLORIDE SOLUTION	UN 2582	CM	x/y
FLAMMABLE LIQUID, NOS	UN 1993	FL	x/y
FORBIDDEN EXPLOSIVES	NONE	- FORBIDDEN TO SHIP	
FORBIDDEN MATERIALS	NONE	- FORBIDDEN TO SHIP	

PROPER SHIPPING NAME AND OTHER NAMES	UN/NA NO.	HAZMAT CLASS	GUIDE PAGE
FORMALDEHYDE SOLUTION (FLASH POINT GREATER THAN 141°F; 110 GALS OR LESS)	UN 2209	ORM-A	x/y
FORMALDEHYDE SOLUTION (FLASH POINT LESS THAN 141°F; OVER 110 GALS)	UN 1198	CL	x/y
FORMALDEHYDE SOLUTION (FLASH POINT LESS THAN 141°F; 110 GALS OR LESS)	UN 1198	ORM-A	x/y
FORMALDEHYDE SOLUTION (FLASH POINT GREATER THAN 141°F; OVER 110 GALS)	UN 2209	CL	x/y
FORMALIN (SEE FORMALDEHYDE SOLUTION)			
FORMONITRILE	NA 1051	PA	x/y
FUEL OIL	NA 1993	CL	x/y
FUEL OIL DISTILLATE	NA 1993	CL	x/y
FUEL, AVIATION, TURBINE ENGINE	UN 1863	CL/FL	x/y
FULMINATE OF MERCURY, DRY	NONE - FORBIDDEN TO SHIP		
FULMINATING GOLD	NONE - FORBIDDEN TO SHIP		
FULMINATING MERCURY	NONE - FORBIDDEN TO SHIP		
FULMINATING PLATINUM	NONE - FORBIDDEN TO SHIP		
FULMINATING SILVER	NONE - FORBIDDEN TO SHIP		
FULMINIC ACID	NONE - FORBIDDEN TO SHIP		
FUMING SULFURIC ACID	NA 1832	CM	x/y
GALACTSAN TRINITRATE	NONE - FORBIDDEN TO SHIP		
GASOHOL	UN 1203	FL	x/y
GASOLINE	UN 1203	FL	x/y
GLACIAL ACETIC ACID	UN 1089	CM	x/y
GLYCEROL-1,3-DINITRATE	NONE - FORBIDDEN TO SHIP		
GLYCEROL MONOGLUCONATE TRINITRATE	NONE - FORBIDDEN TO SHIP		
GUANYL NITROSAMINO GUANYLIDENE HYDRAZINE, DRY	NONE - FORBIDDEN TO SHIP		
GYL COL ETHERS	NA 1993	CL	x/y
HAZARDOUS SUBSTANCE, LIQUID, NOS	NA 9188	ORM-E	x/y

PROPER SHIPPING NAME AND OTHER NAMES	UN/NA NO.	HAZMAT CLASS	GUIDE PAGE
HAZARDOUS SUBSTANCE, SOLID, NOS	NA 9188	ORM-E	x/y
HAZARDOUS SUBSTANCE, SOLUTION, NOS	NA 9188	ORM-E	x/y
HEAVY METAL SALTS OF 2,4- DINITRORESORCINOL, DRY	NONE - FORBIDDEN TO SHIP		
HEAVY METAL SALTS OF 4,6- DINITRORESORCINOL, DRY	NONE - FORBIDDEN TO SHIP		
HEAVY METAL SALTS OF METHYL PICRIC ACID	NONE - FORBIDDEN TO SHIP		
HEXAMETHYLENE DIAMINE SOLUTION	UN 1783	CM	x/y
HEXAMETHYLENE TRIPEROXIDE DIAMINE, DRY	NONE - FORBIDDEN TO SHIP		
HEXAMETHYLENEDIAMINE SOLUTION	UN 1783	CM	x/y
HEXAMETHYLOL BENZENE HEXANITRATE	NONE - FORBIDDEN TO SHIP		
HEXANE	UN 1208	FL	x/y
2,2',4,4',6,6'-HEXANITRO-3,3'- DIHYDROXYAZOBENZENE, DRY	NONE - FORBIDDEN TO SHIP		
HEXANITROAZOXY BENZENE	NONE - FORBIDDEN TO SHIP		
2,2',3',4,4',6-HEXANITRODIPHENYLAMINE	NONE - FORBIDDEN TO SHIP		
2,3',4,4',6,6'-HEXANITRODIPHENYLETHER	NONE - FORBIDDEN TO SHIP		
N,N'-(HEXANITRODIPHENYL)ETHYLENE	NONE - FORBIDDEN TO SHIP		
DINITRAMINE, DRY	NONE - FORBIDDEN TO SHIP		
HEXANITRODIPHENYL UREA	NONE - FORBIDDEN TO SHIP		
HEXANITROETHANE	NONE - FORBIDDEN TO SHIP		
HEXANITROOXANILIDE	NONE - FORBIDDEN TO SHIP		
HOT ALUMINUM DROSS	NONE - FORBIDDEN TO SHIP		
HOT COAL BRIQUETTES	NONE - FORBIDDEN TO SHIP		
HOT COKE	NONE - FORBIDDEN TO SHIP		
HOT MAGNESIUM DROSS	NONE - FORBIDDEN TO SHIP		
HYDRAZINE AZIDE	NONE - FORBIDDEN TO SHIP		
HYDRAZINE CHLORATE	NONE - FORBIDDEN TO SHIP		
HYDRAZINE DICARBONIC ACID DIAZIDE	NONE - FORBIDDEN TO SHIP		
HYDRAZINE PERCHLORATE	NONE - FORBIDDEN TO SHIP		

PROPER SHIPPING NAME AND OTHER NAMES	UN/NA NO.	HAZMAT CLASS	GUIDE PAGE
HYDRAZINE SELENATE	NONE - FORBIDDEN TO SHIP		
HYDROCHLORIC ACID	UN 1789	CM	x/y
HYDROCYANIC ACID	NA 1051	PA	x/y
HYDROCYANIC ACID, LIQUID	NA 1051	PA	x/y
HYDROCYANIC ACID, LIQUIFIED	NA 1051	PA	x/y
HYDROCYANIC ACID (PRUSSIC), UNSTABILIZED	NONE - FORBIDDEN TO SHIP		
HYDROFLUOROSILICIC ACID	NA 1778	CM	x/y
HYDROGEN CHLORIDE	UN 1050	NFG	x/y
HYDROGEN CHLORIDE, ANHYDROUS	UN 1050	NFG	x/y
HYDROGEN CYANIDE	NA 1051	PA	x/y
HYDROGEN FLUORIDE	UN 1052	CM	x/y
HYDROGEN PEROXIDE	UN 2014	OXID	x/y
HYDROGEN PEROXIDE SOLUTION (8%-40% PEROXIDE)	UN 2014	OXID	x/y
HYDROGEN PEROXIDE SOLUTION (40%-52% PEROXIDE)	UN 2014	OXID	x/y
HYDROGEN PEROXIDE SOLUTION (OVER 52% PEROXIDE)	UN 2015	OXID	x/y
HYDROXYL AMINE IODIDE	NONE - FORBIDDEN TO SHIP		
HYPONITROUS ACID	NONE - FORBIDDEN TO SHIP		
INITIATING EXPLOSIVES, DRY	NONE - FORBIDDEN TO SHIP		
INOSITOL HEXANITRATE, DRY	NONE - FORBIDDEN TO SHIP		
INULIN TRINITRATE, DRY	NONE - FORBIDDEN TO SHIP		
IODIDE OF MILLION'S BASE	NONE - FORBIDDEN TO SHIP		
IODINE AZIDE, DRY	NONE - FORBIDDEN TO SHIP		
IODOXY COMPOUNDS, DRY	NONE - FORBIDDEN TO SHIP		
IRIDIUM NITRATOPENTAMINE IRIDIUM NITRATE	NONE - FORBIDDEN TO SHIP		
ISOBUTANE	UN 1075	FG	x/y
ISOBUTYLENE	UN 1075	FG	x/y

PROPER SHIPPING NAME AND OTHER NAMES	UN/NA NO.	HAZMAT CLASS	GUIDE PAGE
ISOPROPANOL	UN 1219	FL	x/y
IOSTHIOCYANIC ACID	NONE - FORBIDDEN TO SHIP		
LEAD AZIDE, DRY	NONE - FORBIDDEN TO SHIP		
LEAD MONONITRORESORCINATE, DRY	NONE - FORBIDDEN TO SHIP		
LEAD PICRATE, DRY	NONE - FORBIDDEN TO SHIP		
LEAD SALT, DRY	NONE - FORBIDDEN TO SHIP		
LEAD SALT	NONE - FORBIDDEN TO SHIP		
LEAD STYPHNATE, DRY	NONE - FORBIDDEN TO SHIP		
LIQUID ACETYLENE	NONE - FORBIDDEN TO SHIP		
LIQUID AMMONIA	UN 1005	NFG	x/y
LIQUID ANILINE OIL	UN 1547	PB	x/y
LIQUID CARBOLIC ACID	NA 2821	PB	x/y
LIQUID CARBON DIOXIDE	UN 2187	NFG	x/y
LIQUID DINITROTOLUENE	UN 1600	ORM-E	x/y
LIQUID HAZARDOUS SUBSTANCE	NA 9188	ORM-E	x/y
LIQUID HYDROCYANIC ACID	NA 1051	PA	x/y
LIQUID NITROGLYCERIN, NOT DESENSITIZED	NONE - FORBIDDEN TO SHIP		
LIQUID PHENOL	UN 1671	PB	x/y
LIQUID POTASSIUM HYDROXIDE	UN 1814	CM	x/y
LIQUID RESIN COMPOUND	UN 2868	CL	x/y
LIQUID RESIN COMPOUND	UN 1866	FL	x/y
LIQUID SODIUM HYDROXIDE	UN 1824	CM	x/y
LIQUID TAR	UN 1999	CL/FL	x/y
LIQUID TETRAETHYL LEAD	UN 1649	PB	x/y
LIQUIFIED AMMONIA	UN 1005	NFG	x/y
LIQUIFIED HYDROCYANIC ACID	NA 1051	PA	x/y
LIQUEFIED PETROLEUM GAS	UN 1075	FG	x/y
LPG	UN 1075	FG	x/y
LOOSE MIXTURES OF SULFUR & CHLORATE	NONE - FORBIDDEN TO SHIP		
MAGNESIUM DROSS, WET OR HOT	NONE - FORBIDDEN TO SHIP		

PROPER SHIPPING NAME AND OTHER NAMES	UN/NA NO.	HAZMAT CLASS	GUIDE PAGE
MALEIC ANHYDRIDE	UN 2215	ORM-A	x/y
MANNITAN TETRANITRATE	NONE - FORBIDDEN TO SHIP		
MERCUROUS AZIDE	NONE - FORBIDDEN TO SHIP		
MERCURY ACETYLIDE	NONE - FORBIDDEN TO SHIP		
MERCURY AND SILVER SALTS	NONE - FORBIDDEN TO SHIP		
MERCURY IODIDE AQUABASIC AMMONOBASIC (IODIDE OF MILLION'S BASE)	NONE - FORBIDDEN TO SHIP		
MERCURY NITRIDE	NONE - FORBIDDEN TO SHIP		
MERCURY OXYCYANIDE	NONE - FORBIDDEN TO SHIP		
METAL SALTS OF METHYL NITRAMINE, DRY	NONE - FORBIDDEN TO SHIP		
METAL SODIUM	UN 1428	FS	x/y
METALLIC SODIUM	UN 1428	FS	x/y
METHANECARBOXYLIC ACID	UN 1089	FL	x/y
METHANOL	UN 1230	FL	x/y
METHANOL, CONTAMINATED	UN 1230	FL	x/y
METHAZOIC ACID	NONE - FORBIDDEN TO SHIP		
METHYL ALCOHOL	UN 1230	FL	x/y
METHYL CHLORIDE	UN 1063	FG	x/y
METHYL ETHYL KETONE	UN 1193	FL	x/y
METHYL ETHYL KETONE PEROXIDE SOLUTION (OVER 9% ACTIVE OXYGEN)	NONE - FORBIDDEN TO SHIP		
METHYL IOSBUTYL KETONE PEROXIDE SOLUTION (OVER 9% ACTIVE OXYGEN)	NONE - FORBIDDEN TO SHIP		
METHYL METHACRYLATE MONOMER, INHIBITED	UN 1247	FL	x/y
METHYL NITRATE	NONE - FORBIDDEN TO SHIP		
METHYL PICRIC ACID, HEAVY METAL SALTS OF	NONE - FORBIDDEN TO SHIP		
METHYLAMINE DINITRAMINE AND DRY SALTS THEREOF	NONE - FORBIDDEN TO SHIP		
METHYLAMINE NITROFORM	NONE - FORBIDDEN TO SHIP		
METHYLAMINE PERCHLORATE, DRY	NONE - FORBIDDEN TO SHIP		

PROPER SHIPPING NAME AND OTHER NAMES	UN/NA NO.	HAZMAT CLASS	GUIDE PAGE
METHYLENE GLYCOL DINITRATE	NONE - FORBIDDEN TO SHIP		
a-METHYLGLUCOSIDE TETRANITRATE	NONE - FORBIDDEN TO SHIP		
a-METHYLGLYCEROL TRINITRATE	NONE - FORBIDDEN TO SHIP		
MIXTURES OF ANTIMONY SULFIDE AND A CHLORATE	NONE - FORBIDDEN TO SHIP		
MIXTURES OF ARSENIC SULFIDE AND A CHLORATE	NONE - FORBIDDEN TO SHIP		
MIXTURES OF RED PHOSPHORUS AND A CHLORATE	NONE - FORBIDDEN TO SHIP		
MIXTURES OF WHITE PHOSPHORUS AND A CHLORATE	NONE - FORBIDDEN TO SHIP		
MONOCHLOROACETONE, UNSTABILIZED	NONE - FORBIDDEN TO SHIP		
MONOCHLORODIFLUOROMETHANE	UN 1028	NFG	x/y
MONOCHLOROETHYLENE	UN 1086	FG	x/y
MONOVINYLCHLORIDE	UN 1086	FG	x/y
<b>MOTOR FUEL ANTIKNOCK COMPOUND</b>	UN 1649	PB	x/y
MVC	UN 1086	FG	x/y
NAPHTHALENE DIOZONIDE	NONE - FORBIDDEN TO SHIP		
NAPHTHYL AMINEPERCHLORATE	NONE - FORBIDDEN TO SHIP		
NATRIUM	UN 1428	FS	x/y
NEMAX	UN 1063	FG	x/y
NICKEL PICRATE	NONE - FORBIDDEN TO SHIP		
NITRATED PAPER, UNSTABILIZED	NONE - FORBIDDEN TO SHIP		
NITRATES OF DIAZONIUM COMPOUNDS	NONE - FORBIDDEN TO SHIP		
2-NITRO-2-METHYLPROPANOL NITRATE	NONE - FORBIDDEN TO SHIP		
6-NITRO-4-DIAZOTOLUENE-3-SULFONIC ACID, DRY	NONE - FORBIDDEN TO SHIP		
N-NITROANILINE	NONE - FORBIDDEN TO SHIP		
m-NITROBENZENE DIAZONIUM PERCHLORATE	NONE - FORBIDDEN TO SHIP		
NITROCHLOROFORM	UN 1063	FG	x/y
NITROCHLOROMETHANE	UN 1063	FG	x/y



PROPER SHIPPING NAME AND OTHER NAMES	UN/NA NO.	HAZMAT CLASS	GUIDE PAGE
NITROETHYLENE POLYMER	NONE	- FORBIDDEN TO SHIP	
NITROETHYL NITRATE	NONE	- FORBIDDEN TO SHIP	
NITROGEN TRICHLORIDE	NONE	- FORBIDDEN TO SHIP	
NITROGEN TRIIODIDE	NONE	- FORBIDDEN TO SHIP	
NITROGEN TRIIODIDE MONOAMINE	NONE	- FORBIDDEN TO SHIP	
NITROGLYCERIN, LIQUID, NOT DESENSITIZED	NONE	- FORBIDDEN TO SHIP	
NITROGUANIDINE NITRATE	NONE	- FORBIDDEN TO SHIP	
1-NITRO HYDANTOIN	NONE	- FORBIDDEN TO SHIP	
NITRO ISOBUTANE TRIOL TRINITRATE	NONE	- FORBIDDEN TO SHIP	
NITROMANNITE, DRY	NONE	- FORBIDDEN TO SHIP	
N-NITRO-N-METHYLGLYCOLAMIDE NITRATE	NONE	- FORBIDDEN TO SHIP	
m-NITROPHENYLDINITRO METHANE	NONE	- FORBIDDEN TO SHIP	
NITROSUGARS, DRY	NONE	- FORBIDDEN TO SHIP	
1,7-OCTADIENE-3,5-DIYNE-1,8-DIMETHOXY- 9-OCTADECYNOIC ACID	NONE	- FORBIDDEN TO SHIP	
OCTYL ALCOHOL	UN 1987	CL/FL	x/y
OIL OF VITRIOL	UN 1830	CM	x/y
OIL, NOS	NA 1270	CL/FL	x/y
OLEUM	NA 1831	CM	x/y
OXIRANE	UN 1040	FL	D47/50
PARTIALLY REFINED PETROLEUM	NA 1270	CL/FL	x/y
PENTAERYTHRITE TETRANITRATE, DRY	NONE	- FORBIDDEN TO SHIP	
PENTANITROANILINE, DRY	NONE	- FORBIDDEN TO SHIP	
PERCHLORIC ACID, (OVER 72% STRENGTH)	NONE	- FORBIDDEN TO SHIP	
PEROXYACETIC ACID (OVER 43% AND OVER 6% HYDROGEN PEROXIDE)	NONE	- FORBIDDEN TO SHIP	
PETROLEUM , PARTIALLY REFINED	NA 1270	CL/FL	x/y
PETROLEUM CRUDE OIL	UN 1267	CL/FL	x/y
PETROLEUM DISTILLATE	UN 1268	CL/FL	x/y
PETROLEUM DISTILLATE FUEL OIL	UN 1268	CL/FL	x/y

PROPER SHIPPING NAME AND OTHER NAMES	UN/NA NO.	HAZMAT CLASS	GUIDE PAGE
PETROLEUM NAPHTHA	UN 1255	CL/FL	x/y
PETROLEUM OIL, NOS	NA 1270	CL/FL	x/y
PETROLEUM, RESIDUAL FUEL OIL	NA 1270	CL/FL	x/y
PHENOL	UN 1671	PB	x/y
PHENOL, LIQUID	NA 2821	PB	x/y
PHENOL, SOLUTION	NA 2821	PB	x/y
m-PHENYLENE DIAMINEDIPERCHLORATE, DRY	NONE - FORBIDDEN TO SHIP		
PHOSPHORIC ACID	UN 1805	CM	x/y
PHOSPHORUS, WHITE	UN 1381	FS	x/y
PHOSPHORUS, WHITE OR RED, AND A CHLORATE, MIXTURES OF	NONE - FORBIDDEN TO SHIP		
PHOSPHORUS, WHITE OR YELLOW, DRY	UN 1381	FS	x/y
PHOSPHORUS, WHITE OR YELLOW, IN WATER	UN 1381	FS	x/y
PHOSPHORUS, WHITE, DRY	UN 1381	FS	x/y
PHOSPHORUS, WHITE, IN WATER	UN 1381	FS	x/y
PHOSPHORUS, YELLOW	UN 1381	FS	x/y
PHOSPHORUS, YELLOW, DRY	UN 1381	FS	x/y
PHOSPHORUS, YELLOW, IN WATER	UN 1381	FS	x/y
PICFUME	UN 1063	FG	x/y
PINTSCH GAS	UN 1075	FG	x/y
PROPADIENE	UN 1075	FG	x/y
POTASSIUM CARBONYL	NONE - FORBIDDEN TO SHIP		
POTASSIUM HYDROXIDE, LIQUID	UN 1814	CM	x/y
POTASSIUM HYDROXIDE, SOLUTION	UN 1814	CM	x/y
PROPADINE-DIMETHYLENE-METHANE	UN 1075	FG	x/y
PROPANE	UN 1075	FG	x/y
PROPANE-PROPYLENE GAS MIXTURE	UN 1075	FG	x/y
PROPIONYL PEROXIDE, (OVER 28% IN SOULTION)	NONE - FORBIDDEN TO SHIP		
PROPYL ALCOHOL	UN 1274	FL	x/y
PROPYLENE	UN 1075	FG	x/y

PROPER SHIPPING NAME AND OTHER NAMES	UN/NA NO.	HAZMAT CLASS	GUIDE PAGE
PROPYLENE OXIDE	UN 1280	FL	x/y
PROPYLENE-PROPANE GAS MIXTURE	UN 1075	FG	x/y
PRUSSIC ACID	NA 1051	PA	x/y
PRUSSIC ACID, UNSTABILIZED	NONE - FORBIDDEN TO SHIP		
PULP MILL LIQUID	UN 1993	FL	x/y
PYRIDINE PERCHLORATE	NONE - FORBIDDEN TO SHIP		
QUEBRACHITOL PENTANITRATE	NONE - FORBIDDEN TO SHIP		
R-12	UN 1028	NFG	x/y
R-22	UN 1018	NFG	x/y
RESIDUAL FUEL OIL	NA 1270	CL/FL	x/y
RESIN COMPOUND, LIQUID	UN 2868	CL	x/y
RESIN COMPOUND, LIQUID	UN 1866	FL	x/y
RED PHOSPHORUS AND A CHLORATE, MIXTURES OF	NONE - FORBIDDEN TO SHIP		
RESIN SOLUTION	UN 2868	CL	x/y
RESIN SOLUTION	UN 1866	FL	x/y
ROSIN SOLUTION	UN 1993	FL	x/y
SALT OF AZAUROLIC ACID, DRY	NONE - FORBIDDEN TO SHIP		
SALTS OF N,N'- DICHLORAZODICARBONAMIDINE, DRY	NONE - FORBIDDEN TO SHIP		
SELENIUM NITRIDE	NONE - FORBIDDEN TO SHIP		
SHAPED CHARGES (COMMERCIAL) CONTAINING OVER 8 OZS. OF EXPLOSIVES	NONE - FORBIDDEN TO SHIP		
SILVER ACETYLIDE, DRY	NONE - FORBIDDEN TO SHIP		
SILVER AZIDE, DRY	NONE - FORBIDDEN TO SHIP		
SILVER CHLORITE, DRY	NONE - FORBIDDEN TO SHIP		
SILVER FULMINATE, DRY	NONE - FORBIDDEN TO SHIP		
SILVER OXALATE, DRY	NONE - FORBIDDEN TO SHIP		
SILVER PICRATE, DRY	NONE - FORBIDDEN TO SHIP		
SODIUM	UN 1428	FS	x/y
SODIUM HYDROSULFIDE, SOLUTION	NA 2922	CM	x/y

PROPER SHIPPING NAME AND OTHER NAMES	UN/NA NO.	HAZMAT CLASS	GUIDE PAGE
SODIUM HYDROXIDE, BEAD	UN 1823	CM	x/y
SODIUM HYDROXIDE, DRY SOLID	UN 1823	CM	x/y
SODIUM HYDROXIDE, FLAKE	UN 1823	CM	x/y
SODIUM HYDROXIDE, GRANULAR	UN 1823	CM	x/y
SODIUM HYDROXIDE, LIQUID	UN 1824	CM	x/y
SODIUM HYDROXIDE, SOLID	UN 1823	CM	x/y
SODIUM HYDROXIDE, SOLUTION	UN 1824	CM	x/y
SODIUM METAL	UN 1428	FS	x/y
SODIUM, METAL	UN 1428	FS	x/y
SODIUM, METAL OR METALLIC	UN 1428	FS	x/y
SODIUM, METALLIC	UN 1428	FS	x/y
SODIUM PICRYL PEROXIDE	NONE - FORBIDDEN TO SHIP		
SODIUM TETRANITRIDE	NONE - FORBIDDEN TO SHIP		
SOLID ACETYL BENZOYL PEROXIDE	NONE - FORBIDDEN TO SHIP		
SOLID ACETYL PEROXIDE	NONE - FORBIDDEN TO SHIP		
SOLUTION OF tert-BUTYL PEROXYACETATE (OVER 76%)	NONE - FORBIDDEN TO SHIP		
SOLUTION OF n-BUTYL PEROXYDICARBONATE (OVER 52%)	NONE - FORBIDDEN TO SHIP		
SOLUTION OF tert-BUTYL PEROXYISOBUTYRATE (OVER 77%)	NONE - FORBIDDEN TO SHIP		
SOLUTION OF DIETHYL PEROXYCARBONATE (OVER 27%)	NONE - FORBIDDEN TO SHIP		
SOLUTION OF DIISOPROPYLBENZENE HYDROPEROXIDE (OVER 72%)	NONE - FORBIDDEN TO SHIP		
SOLUTION OF 2,2-DI-(TERT- BUTYLPEROXY) BUTANE (OVER 55%)	NONE - FORBIDDEN TO SHIP		
SOLUTION OF DI-(TERT-BUTYLPEROXY) PHTHALATE (OVER 55%)	NONE - FORBIDDEN TO SHIP		
SOLUTION OF PROPIONYL PEROXIDE (OVER 28%)	NONE - FORBIDDEN TO SHIP		

PROPER SHIPPING NAME AND OTHER NAMES	UN/NA NO.	HAZMAT CLASS	GUIDE PAGE
SOLVENT, NOS	NA 1993	CL/FL	x/y
SPENT SULFURIC ACID	UN 1830	CM	x/y
STYRENE MONOMER, INHIBITED	UN 2055	FL	x/y
STYRENE, LIQUID	UN 2055	FL	x/y
SUCROSE OCTANITRATE, DRY	NONE - FORBIDDEN TO SHIP		
SULFUR AND CHLORATE, LOOSE MIXTURES OF	NONE - FORBIDDEN TO SHIP		
SULFUR DIOXIDE	UN 1079	NFG	x/y
SULFURIC ACID	UN 1830	CM	x/y
SULFURIC ACID, FUMING	NA 1831	CM	x/y
SULFURIC ACID, SPENT	UN 1832	CM	x/y
TAR, LIQUID	UN 1999	CL/FL	x/y
TEL	UN 1649	PB	x/y
TETRAAZIDO BENZENE QUINONE	NONE - FORBIDDEN TO SHIP		
TETRAETHYL LEAD, LIQUID	UN 1649	PB	x/y
TETRAETHYLAMMONIUM PERCHLORATE, DRY	NONE - FORBIDDEN TO SHIP		
TETRAETHYLLEAD	UN 1649	PB	x/y
TETRAMETHYLENE DIPEROXIDE DICARBAMIDE	NONE - FORBIDDEN TO SHIP		
2,3,4,6-TETRANITROPHENOL	NONE - FORBIDDEN TO SHIP		
2,3,4,6-TETRANITROPHENYL METHYL NITRAMINE	NONE - FORBIDDEN TO SHIP		
2,3,4,6-TETRANITROPHENYLNITRAMINE	NONE - FORBIDDEN TO SHIP		
TETRANITRORESORCINOL, DRY	NONE - FORBIDDEN TO SHIP		
2,3,5,6-TETRANITROSO-1,4- DINITROBENZENE	NONE - FORBIDDEN TO SHIP		
2,3,5,6-TETRANITROSO NITROBENZENE, DRY	NONE - FORBIDDEN TO SHIP		
TETRAZINE, DRY	NONE - FORBIDDEN TO SHIP		
TETRAZOLYL AZIDE, DRY	NONE - FORBIDDEN TO SHIP		
TOLUENE	UN 1294	FL	x/y
TOLUENE DIISOCYANATE	UN 2078	PB	x/y
TOLUOL	UN 1294	FL	x/y
TRI-(B-NITROXYETHYL)AMMONIUM NITRATE	NONE - FORBIDDEN TO SHIP		

PROPER SHIPPING NAME AND OTHER NAMES	UN/NA NO.	HAZMAT CLASS	GUIDE PAGE
TRICHLOROMETHYL PERCHLORATE	NONE - FORBIDDEN TO SHIP		
TRICHLORONITROMETHANE	UN 1063	FG	x/y
TRIFORMOXIME TRINITRATE	NONE - FORBIDDEN TO SHIP		
1,3,5-TRIMETHYL-2,4,6-TRINITROBENZENE	NONE - FORBIDDEN TO SHIP		
TRIMETHYLENE GLYCOL DIPERCHLORATE	NONE - FORBIDDEN TO SHIP		
TRIMETHYLOL NITROMETHANE TRINITRATE	NONE - FORBIDDEN TO SHIP		
2,4,6-TRINITRO-1,3,5-TRIAZIDO BENZENE, DRY	NONE - FORBIDDEN TO SHIP		
2,4,6-TRINITRO-1,3-DIAZOBENZENE	NONE - FORBIDDEN TO SHIP		
TRINITROACETIC ACID	NONE - FORBIDDEN TO SHIP		
TRINITROACETONITRILE	NONE - FORBIDDEN TO SHIP		
TRINITROAMINE COBALT	NONE - FORBIDDEN TO SHIP		
TRINITROETHANOL	NONE - FORBIDDEN TO SHIP		
TRINITROETHYLNITRATE	NONE - FORBIDDEN TO SHIP		
TRINITROMETHANE	NONE - FORBIDDEN TO SHIP		
1,3,5-TRINITRONAPHTHALENE	NONE - FORBIDDEN TO SHIP		
2,4,6-TRINITROPHENYL GUANIDINE, DRY	NONE - FORBIDDEN TO SHIP		
2,4,6-TRINITROPHENYL NITRAMINE	NONE - FORBIDDEN TO SHIP		
2,4,6-TRINITROPHENYL TRIMETHYLOL METHYL NITRAMINE TRINITRATE, DRY	NONE - FORBIDDEN TO SHIP		
2,4,6-TRINITROSO-3-METHYL NITRAMINOANISOLE	NONE - FORBIDDEN TO SHIP		
TRINITROTETRAMINE COBALT NITRATE	NONE - FORBIDDEN TO SHIP		
TRIS, BIS-BIFLUOROAMINO DIETHOXY PROPANE (TVOPA)	NONE - FORBIDDEN TO SHIP		
TRIPTENE	UN 1075	FG	x/y
TURBINE ENGINE AVIATION FUEL	UN 1863	CL/FL	x/y
TVOPA	NONE - FORBIDDEN TO SHIP		
UNDESENSITIZED LIQUID NITROGLYCERIN	NONE - FORBIDDEN TO SHIP		
UNDESENSITIZED NITROGLYCERIN, LIQUID	NONE - FORBIDDEN TO SHIP		
UNINHIBITED CHLOROPRENE	NONE - FORBIDDEN TO SHIP		

PROPER SHIPPING NAME AND OTHER NAMES	UN/NA NO.	HAZMAT CLASS	GUIDE PAGE
UNSTABILIZED HYDROCYANIC ACID	NONE	- FORBIDDEN TO SHIP	
UNSTABILIZED MONOCHLOROACETONE	NONE	- FORBIDDEN TO SHIP	
UNSTABILIZED NITRATED PAPER	NONE	- FORBIDDEN TO SHIP	
UNSTABILIZED PRUSSIC ACID	NONE	- FORBIDDEN TO SHIP	
VC	UN 1086	FG	x/y
VCL	UN 1086	FG	x/y
VCM	UN 1086	FG	x/y
VINEGAR ACID	UN 2789	CM	x/y
VINYL ACETATE	UN 1301	FL	x/y
VINYL C MONOMER	UN 1086	FG	x/y
VINYL CHLORIDE	UN 1086	FG	x/y
VINYL CHLORIDE MONOMER	UN 1086	FG	x/y
VINYL CHLORIDE, INHIBITED	UN 1086	FG	x/y
VINYL ETHENE	UN 1010	FG	x/y
VINYL ETHYLENE	UN 1010	FG	x/y
VINYL NITRATE POLYMER	NONE	- FORBIDDEN TO SHIP	
VINYLETHYLENE	UN 1010	FG	x/y
VINYLDIENE CHLORIDE, INHIBITED	UN 1303	FL	x/y
WET ALUMINUM DROSS	NONE	- FORBIDDEN TO SHIP	
WET CHARCOAL SCREENINGS	NONE	- FORBIDDEN TO SHIP	
WET CHARCOAL	NONE	- FORBIDDEN TO SHIP	
WET MAGNESIUM DROSS	NONE	- FORBIDDEN TO SHIP	
WHITE PHOSPHORUS	UN 1381	FS	x/y
WHITE PHOSPHORUS AND A CHLORATE, MIXTURES OF	NONE	- FORBIDDEN TO SHIP	
XYLENE	UN 1307	FL	x/y
XYLOL	UN 1307	FL	x/y
p-XYLYL DIAZIDE	NONE	- FORBIDDEN TO SHIP	
YELLOW PHOSPHORUS	UN 1381	FS	x/y

FLAMMABLE LIQUID  
HAZARD CLASS INFORMATION

LOADING AND UNLOADING PRECAUTIONS AND REQUIREMENTS (49 CFR 173.300)

FLAMMABLE LIQUIDS may not be loaded or transported in a tank car equipped with any type of lighted heated or open flame device or in a tank car equipped with any apparatus or mechanism utilizing an internal combustion engine in its operation.

DELIVERY AND STORAGE REQUIREMENTS (49 CFR 173.300 & 173.304)

FLAMMABLE LIQUIDS may not be stored in a tank car equipped with any type of lighted heated or open flame device or in a tank car equipped with any apparatus or mechanism utilizing an internal combustion engine in its operation.

A tank car containing a FLAMMABLE LIQUID, other than liquid road asphalt or tar, may not be transported by rail unless it is originally consigned or subsequently reconsigned to a party having a private track on which it is to be delivered and unloaded or to a party using railroad siding facilities which are equipped for piping the liquid from the tank car to permanent storage tanks of sufficient capacity to receive the entire contents of the tank car.

RESTRICTION ON THE POSITION OF THE TANK CAR IN THE TRAIN

SWITCHING REQUIREMENTS

EMPTY TANK CARS AND CLEANING REQUIREMENTS

INSPECTION REQUIREMENTS

For the above topics, see GENERAL INFORMATION FOR SHIPPING ALL HAZARDOUS MATERIALS section (pages D5-D19).



## ORGANIZATIONS TO CONTACT FOR INFORMATION ON FLAMMABLE LIQUIDS

The Combustion Institute  
The Ethylene Oxide Industry Council  
The American Petroleum Institute  
The National Petroleum Council  
The National Petroleum Refiners Association  
The Spill Control Association of America

(CONTRACTOR'S NOTE: The above list is a potential sample of organizations. Each organization would have to be contacted to determine if it has the ability to provide assistance to a user of this guide. Addresses and phone numbers with points of contact would be provided.)

## EXPLANATION OF INFORMATION CONTAINED IN THE COMMODITY SECTIONS OF THIS GUIDEBOOK

The Commodity Information sections for each FLAMMABLE LIQUID will consist of the following main items of interest:

- the Proper Shipping Name as well as Other Names of the commodity
- the Hazard Class
- commodity Identification Numbers (the DOT Emergency Response Guide (ERG) Number, the UN/NA Identification Number, and the Standard Transportation Commodity Code (STCC) Number)
- a Brief Commodity Description
- the Nature of the Major Hazards of the commodity

- the Authorized DOT Specification for Tank Cars
- Tank Car Construction Special Features for the commodity
- Special Handling Provisions for the commodity
- Marking and Placarding Requirements
- Major Past Safety Violations involving this commodity
- Other Special Notes and/or Clarifications as required
- space for the user of the guide to make their own notes regarding this commodity

## COMMODITY INFORMATION

### ETHYLENE OXIDE

OTHER NAMES: Epoxyethane, Ethyleneoxide,  
Oxirane, and Anprolene

1. HAZARD CLASS: Flammable Liquid

2. IDENTIFICATION CODES:

DOT ERG NUMBER: 69  
U.N. NUMBER: UN 1040  
STCC NUMBER: 4906610

3. BRIEF COMMODITY  
DESCRIPTION:

A clear, colorless flammable gas at ordinary room temperature with an ethereal odor; liquid below 53.6°F; boiling point 51.26°F; flash point -167.8°F. Soluble in water, alcohol, and ether. Weight 7.25 lbs/gal. Shipped as a liquid.

4. NATURE OF THE MAJOR  
HAZARDS:

Toxic and irritating to eyes, respiratory system, and skin. High concentrations can cause pulmonary edema. Prolonged contact may cause delayed burns. Liquid vapor is heavier than air and seeks low areas where it can accumulate. Volatile and thermally unstable. Also corrosive. If contaminated, it may polymerize violently, producing heat and the rupture of the container.

5. AUTHORIZED DOT  
SPECIFICATION FOR  
TANK CARS:

DOT105A100W (pg. D58)  
DOT111A100W4 (pg. D59)  
(49 CFR 173.124(a)(5)) SEE THE  
"TANK CAR SPECIFICATION AND TEST  
REQUIREMENTS" SECTION (pg. D54)  
FOR ADDITIONAL CLARIFICATION.

6. TANK CAR CONSTRUCTION  
SPECIAL FEATURES  
FOR ETHYLENE OXIDE:  
(49 CFR 173.124(a)(5))  
(49 CFR 179.100)  
(49 CFR 179.200)  
(49 CFR 179.201)  
(49 CFR 179.202-18)

- (1) Each specification tank car must:
- (a) have sufficient outage to prevent the tank from becoming liquid full at 105°F.
  - (b) be padded, whether loaded or empty, with dry nitrogen or other suitable inert gas.
  - (c) have no material of the car's construction made of copper, silver, mercury, magnesium, or their alloys come into contact with the ethylene oxide or its vapor.
  - (d) be equipped with excess flow valves for the car's interior pipes of liquid discharge valves, vapor lines, gauging devices, and sampling lines.
  - (e) be equipped with a thermometer well.
  - (f) be insulated with glass fiber except those cars built before 1/31/75 may be insulated with cork.

- (g) have no neoprene, natural rubber, or asbestos gaskets as these are prohibited.
- (2) Openings in tank heads are authorized for cars constructed prior to 1/1/75.
- (3) Each DOT105A100W tank car must be equipped with a 75 psig safety valve and must be stenciled "DOT105A100W" and those cars built after 8/31/81 shall conform to the DOT105J class specifications.
- (4) Each DOT111A100W4 tank car must have an approved and installed protective housing for the safety relief valve if the valve is not located on the manway housing and the tank car must not be equipped with any vacuum relief valves.

7. SPECIAL HANDLING  
PROVISIONS:

Ethylene oxide may not be loaded, transported, or stored in a car equipped with any type of lighted heater, open flame device, or equipped with any apparatus or mechanism utilizing an internal combustion engine. Ethylene oxide may not be transported by rail unless it is originally consigned, or when to be reconsigned, to a party having a private track on which it is to be

delivered and unloaded or to a party using railroad siding facilities which are equipped for piping the liquid from the tank car to permanent storage tanks large enough to receive the car's entire contents.  
**(49 CFR 174.300(a) & 49 CFR 174.304)**

8. MARKING AND PLACARDING REQUIREMENTS: Each tank car used for the transport of ethylene oxide must be stenciled "ETHYLENE OXIDE" on each side of the tank car tank. "FLAMMABLE" placards shall be placed on each side and on each end of the tank car. "FLAMMABLE" placards may also display the UN number "1040". If not displayed on the placard, orange panels displaying "1040" are required to be displayed with each of the "FLAMMABLE" placards. SEE THE MARKING AND PLACARDING SECTION EXAMPLE NUMBER 2 (pg. D60). (49 CFR 172.330)
9. MAJOR PAST SAFETY VIOLATIONS: TO BE PROVIDED AS THEY PERTAIN TO THIS PARTICULAR COMMODITY
10. OTHER SPECIAL NOTES AND/OR CLARIFICATIONS: TO BE PROVIDED WHEN ITEMS OF INFORMATION PERTAIN SPECIFICALLY TO A PARTICULAR COMMODITY.
11. USER NOTES ABOUT THIS COMMODITY: SPACE FOR THE HMSG USER TO MAKE THEIR OWN NOTES.

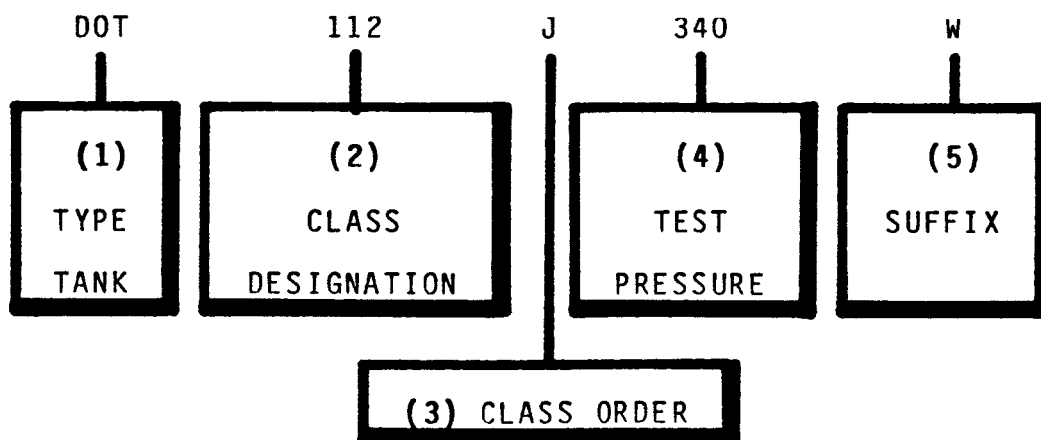
# TANK CAR SPECIFICATION AND TEST REQUIREMENTS

## PART I

### EXPLANATION OF RAILROAD TANK CAR SPECIFICATIONS

DOT authorizes a wide variety of tank cars for use in shipment of Hazardous Materials. You must determine the type of tank cars authorized for use in shipping a particular commodity (identified with the particular commodity in this guide). The CFR and this guide provide authorized cars in a specification format. The following information provides a general explanation of tank car specification formats.

The class of a tank car is a general designation. The specification is a specific designation. Thus, Classes DOT112A, DOT112J, DOT112S, or DOT112T have several specification cars within each of these classes. An example of specific designation is DOT-112J340-W (dashes may or may not be used in the specification):



Numbered boxes are:

(1) A three letter prefix indicates the approving authority of the tank car:

DOT - Department of Transportation

AAR - American Association of Railroads

ICC - Interstate Commerce Commission

(2) The three numbers following the approving authority prefix identify the class designation of the tank car. The numbers have no special meaning. They are arbitrarily assigned numbers to distinguish one class from another.

(3) The letter immediately following the class designation provides specific identification information about the tank car. Each letter provides specific information as follows:

- "A" - has no special significance except for DOT103, DOT104, and DOT113 classes (explained in PART II of this section). For all classes except these, it is basically a "place holder" in the specification designation.
- "B" - tank car is made of carbon steel with an elastimer liner and has top-and-bottom shelf couplers (DOT103 class only).
- "C", "D", or "E" - tank car is made of alloy (stainless) steel and has top-and-bottom shelf couplers (DOT103 class only).
- "S" - Tank car has head shields and top-and-bottom shelf couplers.



- "J" - Tank car has head shields, a thermal protection system enclosed in a metal jacket, and has top-and-bottom shelf couplers.
- "T" - Tank car has head shields, a non-jacketed thermal protection system, and top-and-bottom shelf couplers.

(4) A two or three digit number indicates PSIG rated test pressure. Generally, you may use tanks of a higher rated test pressure. You may also use tanks of a higher order specification. Thus you may use DOT-114J in place of DOT-114S because a higher order tank car encompasses all the general features of a lower order tank car (specific criteria for a particular commodity use must be complied with for higher order cars).

(5) A "W", "F", or "X" follows the rated pressure or other designator. It indicates:

- "W" - tank car is fusion welded
- "F" - tank car is forge welded
- "X" - tank car has a fusion welded longitudinal tank seam and forge welded head seams.

The omission of "W", "F", or "X" in this position of the specification indicates a tank car of seamless construction.

Certain other designations (alpha-numeric) may be found between items (4) and (5) above and after item (5) above. These are explained in PART II of this section.

## TANK CAR RETROFITS

(CONTRACTOR'S NOTE: This sub-section would discuss the major retrofits of tank cars that were ongoing at the guide's publication or due to be initiated in the near future.)

## CANADIAN TANK CARS

(CONTRACTOR'S NOTE: This sub-section would provide information pertinent to Canadian tank cars that are authorized for the transport of hazardous materials in the United States as required by the objectives and scope of the guidebook.)

## EXPLANATION OF PART II CONTENTS

Part II of this section provides the general details of construction for Tank Car Classes and Specification Tank Cars. The information contained is organized first by Tank Car Class. The general construction characteristics which define all tank cars of the specified class are provided AND will apply as construction characteristics for all Specification Tank Cars of that class. Second, the Tank Car Specification itself is provided along with those construction characteristics which make it a unique specification within its class. Information regarding tank car test and retest requirements is also provided with each Tank Car Specification.

PART II  
TANK CAR CLASS AND INDIVIDUAL CAR SPECIFICATIONS

CLASS SPECIFICATION

CHARACTERISTICS

TANK CAR SPECIFICATION

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DOT105A Class	Insulated pressure cars with a manway nozzle, designed for top loading and unloading; bottom outlets and washouts are prohibited. Equipped with top-and-bottom shelf couplers.
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DOT105A100W	A carbon steel, fusion welded tank car with a test pressure of 100 psig. May or may not be equipped with excess flow valves, gauging device, sampling valve, and/or sump/siphon bowl. Safety relief valves are required and must be rated at 75 psig. The tank and interior heater systems must be retested every 10 years and the safety relief valve every 5 years. Tank retest pressure must be 100 psig. Safety relief valve start to discharge retest pressure must be 75 psig and the vapor tight retest pressure must be 60 psig.
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DOT105J Class	Insulated pressure cars with a manway nozzle, designed for top loading and unloading; bottom outlets and washouts are prohibited. Equipped with jacketed thermal protection, tank head puncture resistance, and top-and-bottom shelf couplers.
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FOR EXPLANATION OF TANK CAR SPECIFICATION SEE PAGE D54.

CLASS SPECIFICATIONCHARACTERISTICSTANK CAR SPECIFICATION

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DOT105S Class	Insulated pressure cars with a manway nozzle, designed for top loading and unloading; bottom outlets and washouts are prohibited. Equipped with tank head puncture resistance, and top-and-bottom shelf couplers.
DOT111A Class	Insulated or uninsulated non-pressure cars without an expansion dome. The expansion capacity of the tank is 2%. Equipped with top-and-bottom shelf couplers.
DOT111A100WA	Must be equipped with a gauging device and safety relief valve on top of tank shell and set for 75 psig. Insulation is required and car has top loading and unloading devices and valves. A carbon steel, fusion welded tank car with a test pressure of 100 psig. Safety vents are prohibited. Tank car may or may not be equipped with sump/siphon bowl, sampling device, and/or thermometer well. The tank and interior heater systems must be retested every 10 years and the safety relief valve every 5 years. Tank retest pressure must be 100 psig. Safety relief valve start to discharge retest pressure must be 75 psig and the vapor tight retest pressure must be 60 psig.

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FOR EXPLANATION OF TANK CAR SPECIFICATION SEE PAGE D54.

# MARKING AND PLACARDING

NUMBER

PLACARD  
REQUIRED

ALTERNATE METHOD

1



THE FLAMMABLE GAS PLACARD WITH THE WHITE CENTER AREA DISPLAYING THE PROPER UN/NA NUMBER FOR THE COMMODITY BEING TRANSPORTED MAY BE USED - OR - THE FLAMMABLE GAS PLACARD WITHOUT THE WHITE CENTER AREA MUST BE USED IN CONJUNCTION WITH THE ORANGE PANEL WHICH DISPLAYS THE PROPER UN/NA NUMBER FOR THE COMMODITY BEING TRANSPORTED. SEE NUMBER 12 FOR EMPTY PLACARDS. PLACARD TANK CAR ON ALL FOUR SIDES.

2



THE FLAMMABLE PLACARD WITH THE WHITE CENTER AREA DISPLAYING THE PROPER UN/NA NUMBER FOR THE COMMODITY BEING TRANSPORTED MAY BE USED - OR - THE FLAMMABLE PLACARD WITHOUT THE WHITE CENTER AREA MUST BE USED IN CONJUNCTION WITH THE ORANGE PANEL WHICH DISPLAYS THE PROPER UN/NA NUMBER FOR THE COMMODITY BEING TRANSPORTED. SEE NUMBER 12 FOR EMPTY PLACARDS. PLACARD TANK CAR ON ALL FOUR SIDES.

NUMBER

PLACARD  
REQUIRED

ALTERNATE METHOD

3



THE NON-FLAMMABLE GAS PLACARD WITH THE WHITE CENTER AREA DISPLAYING THE PROPER UN/NA NUMBER FOR THE COMMODITY BEING TRANSPORTED MAY BE USED - OR - THE NON-FLAMMABLE GAS PLACARD WITHOUT THE WHITE CENTER AREA MUST BE USED IN CONJUNCTION WITH THE ORANGE PANEL WHICH DISPLAYS THE PROPER UN/NA NUMBER FOR THE COMMODITY BEING TRANSPORTED. SEE NUMBER 12 FOR EMPTY PLACARDS. PLACARD TANK CAR ON ALL FOUR SIDES.

4



THE CHLORINE PLACARD MUST BE USED. SEE NUMBER 12 FOR EMPTY PLACARDS. PLACARD TANK CAR ON ALL FOUR SIDES.

NUMBER

PLACARD  
REQUIRED

ALTERNATE METHOD

5



THE POISON GAS PLACARD MUST BE USED. SEE NUMBER 12 FOR EMPTY PLACARDS. PLACARD TANK CAR ON ALL FOUR SIDES.

6



THE POISON PLACARD WITH THE WHITE CENTER AREA DISPLAYING THE PROPER UN/NA NUMBER FOR THE COMMODITY BEING TRANSPORTED MAY BE USED - OR - THE POISON PLACARD WITHOUT THE WHITE CENTER AREA MUST BE USED IN CONJUNCTION WITH THE ORANGE PANEL WHICH DISPLAYS THE PROPER UN/NA NUMBER FOR THE COMMODITY BEING TRANSPORTED. SEE NUMBER 12 FOR EMPTY PLACARDS. PLACARD TANK CAR ON ALL FOUR SIDES.

NUMBER

PLACARD  
REQUIRED

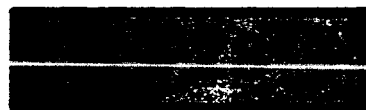
ALTERNATE METHOD

7



THE FLAMMABLE SOLID PLACARD WITH THE WHITE CENTER AREA DISPLAYING THE PROPER UN/NA NUMBER FOR THE COMMODITY BEING TRANSPORTED MAY BE USED - OR - THE FLAMMABLE SOLID PLACARD WITHOUT THE WHITE CENTER AREA MUST BE USED IN CONJUNCTION WITH THE ORANGE PANEL WHICH DISPLAYS THE PROPER UN/NA NUMBER FOR THE COMMODITY BEING TRANSPORTED. SEE NUMBER 12 FOR EMPTY PLACARDS. PLACARD TANK CAR ON ALL FOUR SIDES.

8



THE FLAMMABLE SOLID, DANGEROUS WHEN WET PLACARD WITH THE WHITE CENTER AREA DISPLAYING THE PROPER UN/NA NUMBER FOR THE COMMODITY BEING TRANSPORTED MAY BE USED - OR - THE FLAMMABLE SOLID, DANGEROUS WHEN WET PLACARD WITHOUT THE WHITE CENTER AREA MUST BE USED IN CONJUNCTION WITH THE ORANGE PANEL WHICH DISPLAYS THE PROPER UN/NA NUMBER FOR THE COMMODITY BEING TRANSPORTED. SEE NUMBER 12 FOR EMPTY PLACARDS. PLACARD TANK CAR ON ALL FOUR SIDES.



NUMBER

PLACARD  
REQUIRED

ALTERNATE METHOD

9



THE CORROSIVE PLACARD WITH THE WHITE CENTER AREA DISPLAYING THE PROPER UN/NA NUMBER FOR THE COMMODITY BEING TRANSPORTED MAY BE USED - OR - THE CORROSIVE PLACARD WITHOUT THE WHITE CENTER AREA MUST BE USED IN CONJUNCTION WITH THE ORANGE PANEL WHICH DISPLAYS THE PROPER UN/NA NUMBER FOR THE COMMODITY BEING TRANSPORTED. SEE NUMBER 12 FOR EMPTY PLACARDS. PLACARD TANK CAR ON ALL FOUR SIDES.

10



THE OXIDIZER PLACARD WITH THE WHITE CENTER AREA DISPLAYING THE PROPER UN/NA NUMBER FOR THE COMMODITY BEING TRANSPORTED MAY BE USED - OR - THE OXIDIZER PLACARD WITHOUT THE WHITE CENTER AREA MUST BE USED IN CONJUNCTION WITH THE ORANGE PANEL WHICH DISPLAYS THE PROPER UN/NA NUMBER FOR THE COMMODITY BEING TRANSPORTED. SEE NUMBER 12 FOR EMPTY PLACARDS. PLACARD TANK CAR ON ALL FOUR SIDES.

NUMBER

PLACARD  
REQUIRED

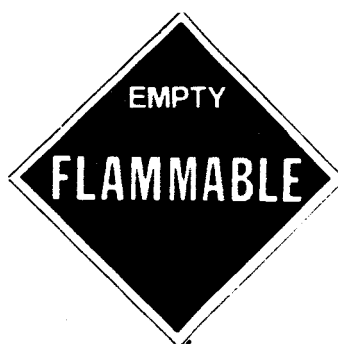
ALTERNATE METHOD

11



THE COMBUSTIBLE PLACARD WITH THE WHITE CENTER AREA DISPLAYING THE PROPER UN/NA NUMBER FOR THE COMMODITY BEING TRANSPORTED MAY BE USED - OR - THE COMBUSTIBLE PLACARD WITHOUT THE WHITE CENTER AREA MUST BE USED IN CONJUNCTION WITH THE ORANGE PANEL WHICH DISPLAYS THE PROPER UN/NA NUMBER FOR THE COMMODITY BEING TRANSPORTED. SEE NUMBER 12 FOR EMPTY PLACARDS. PLACARD TANK CAR ON ALL FOUR SIDES.

12



EACH EMPTY TANK CAR (EXCEPT WHEN LAST LOADED WITH A COMBUSTIBLE MATERIAL) MUST BE PLACARDED WITH AN EMPTY PLACARD UNLESS RELOADED WITH THE SAME TYPE MATERIAL OR PROPERLY CLEANED. THE BACKGROUND OF THE PLACARD WILL CORRESPOND TO THE PLACARD USED WHEN THE TANK CAR WAS LOADED. PLACARD TANK CAR ON ALL FOUR SIDES.